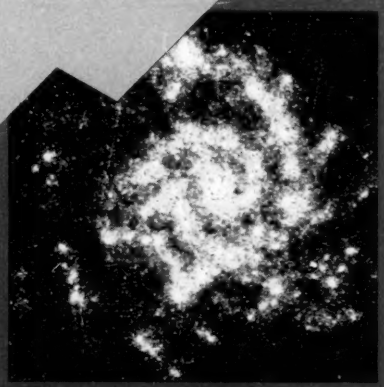
Scientific and Technical Aerospace Reports

STAR



An Abstract Journal

NASA STI PROGRAM SCIENTIFIC & TECHNICAL INFORMATION

Volume 30, Number 18
September 23, 1992
N92-27198 to N92-28222

Scientific and Technical Aerospace Reports

Scientific and Technical Aerospace Reports (STAR) is an abstract journal that provides comprehensive coverage of worldwide aerospace-related reports. It is a major product of the International Aerospace Database managed by the NASA Scientific and Technical Information (STI) Program. The coverage includes reports on aeronautics, space, and supporting disciplines. *STAR* lists current, publicly available reports entered into the NASA STI Database during the 2-week period preceding publication. A typical citation and abstract appear on page viii. They explain how to read the items that are announced in this journal.

NASA sponsors a companion journal, *International Aerospace Abstracts (IAA)* (*NOVA* for internal NASA use) that lists abstracts of the open literature on aerospace subjects available worldwide. *IAA* is available for sale through the AIAA.

Entries found in *STAR* and *IAA* are available through NASA's online service, RECON, as the International Aerospace Database and through DIALOG as the Aerospace Database.

Information on aerospace and related subjects is gathered by the NASA STI Program through national and international agreements and exchanges and is made available to the NASA community as well as to the public in many forms through various outlets. The section on NASA STI Program Products and Services contains additional information.

For further information please contact:
NASA Center for AeroSpace Information (CASI)
P.O. Box 8757
Baltimore, Maryland 21240-0757
(301) 621-0390

US ISSN 0036-8741

Volume 30 Number 18 / September 23, 1992

TABLE OF CONTENTS

AERONAUTICS For related information see also *Astronautics.*

01 AERONAUTICS (GENERAL) **3031**

02 AERODYNAMICS **3035**
Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also *34 Fluid Mechanics and Heat Transfer.*

03 AIR TRANSPORTATION AND SAFETY **3043**
Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION **3044**
Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *32 Communications and Radar.*

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE **3045**
Includes aircraft simulation technology. For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.* For land transportation vehicles see *85 Urban Technology and Transportation.*

06 AIRCRAFT INSTRUMENTATION **3047**
Includes cockpit and cabin display devices; and flight instruments. For related information see also *19 Space craft Instrumentation* and *35 Instrumentation and Photography.*

07 AIRCRAFT PROPULSION AND POWER **3048**
Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

08 AIRCRAFT STABILITY AND CONTROL **3050**
Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information see also *05 Aircraft Design, Testing and Performance.*

09 RESEARCH AND SUPPORT FACILITIES (AIR) **3051**
Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information see also *14 Ground Support Systems and Facilities (Space).*

ASTRONAUTICS For related information see also *Aeronautics.*

12 ASTRONAUTICS (GENERAL) **3053**
For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

13 ASTRODYNAMICS **3053**
Includes powered and free-flight trajectories; and orbital and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) ..... **N.A.**
Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators. For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES **3054**
Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information see also *20 Spacecraft Propulsion and Power.*

16 SPACE TRANSPORTATION **3054**
Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance.* For space suits see *54 Man/System Technology and Life Support.*

17 SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING . **3055**
Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout. For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

N.A.—no abstracts were assigned to this category for this issue.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE **3055**
Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics,* and *16 Space Transportation.*

19 SPACECRAFT INSTRUMENTATION ..... **N.A.**
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 SPACECRAFT PROPULSION AND POWER **3066**
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion,* and *15 Launch Vehicles and Space Vehicles.*

CHEMISTRY AND MATERIALS

23 CHEMISTRY AND MATERIALS (GENERAL) ..... **N.A.**

24 COMPOSITE MATERIALS **3068**
Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see *27 Nonmetallic Materials.*

25 INORGANIC AND PHYSICAL CHEMISTRY **3071**
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS **3073**
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS **3075**
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials.*

28 PROPELLANTS AND FUELS **3079**
Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

29 MATERIALS PROCESSING **3081**
Includes space-based development of products and processes for commercial application. For biological materials see *55 Space Biology.*

ENGINEERING For related information see also *Physics.*

31 ENGINEERING (GENERAL) **3081**
Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 COMMUNICATIONS AND RADAR **3082**
Includes radar; land and global communications; communications theory; and optical communications. For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking.* For search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING **3088**
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER **3094**
Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY **3106**
Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS **3107**
Includes parametric amplifiers. For related information see also *76 Solid-State Physics.*

37 MECHANICAL ENGINEERING **3109**
Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY **3114**
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS **3115**
Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) ..... **N.A.**

43 EARTH RESOURCES AND REMOTE SENSING **3118**
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION **3123**
Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *28 Propellants and Fuels.*

45 ENVIRONMENT POLLUTION **3124**
Includes atmospheric, noise, thermal, and water pollution.

46 GEOPHYSICS **3126**
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY **3128**
Includes weather forecasting and modification.

48 OCEANOGRAPHY **3131**
Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also *43 Earth Resources and Remote Sensing.*

LIFE SCIENCES

51 LIFE SCIENCES (GENERAL) **3136**

52 AEROSPACE MEDICINE **3136**
Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

53 BEHAVIORAL SCIENCES **3138**
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT **3142**
Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also *16 Space Transportation.*

55 SPACE BIOLOGY ..... **N.A.**
Includes exobiology; planetary biology; and extraterrestrial iife.

MATHEMATICAL AND COMPUTER SCIENCES

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) ..... **N.A.**

60 COMPUT4R OPERATIONS AND HARDWARE **3144**
Includes hardware for computer graphics, firmware, and data processing. For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE **3145**
Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

62 COMPUTER SYSTEMS **3153**
Includes computer networks and special application computer systems.

63 CYBERNETICS **3154**
Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS **3157**
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY **3159**
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS **3160**
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS **3161**
Includes topology and number theory.

PHYSICS For related information see also *Engineering.*

70 PHYSICS (GENERAL) **3161**
For precision time and time interval (PTTI) see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics.*

71 ACOUSTICS **3162**
Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS **3163**
Includes atomic structure, electron properties, and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS **3166**
Includes elementary and nuclear particles; and reactor theory. For space radiation see *93 Space Radiation.*

74 OPTICS **3166**
Includes light phenomena and optical devices. For lasers see *36 Lasers and Masers.*

75 PLASMA PHYSICS **3171**
Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **3175**
Includes superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **3178**
Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

80 SOCIAL SCIENCES (GENERAL) **3179**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **3180**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE **3183**
Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS **3188**
Includes cost effectiveness studies.

84 LAW, POLITICAL SCIENCE AND SPACE POLICY ..... **N.A.**
Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION ..... **N.A.**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) ..... **N.A.**

89 ASTRONOMY **3188**
Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 ASTROPHYSICS **3190**
Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also *75 Plasma Physics.*

91 LUNAR AND PLANETARY EXPLORATION **3193**
Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance.*

92 SOLAR PHYSICS **3194**
Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation.*

93 SPACE RADIATION **3195**
Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

99 GENERAL **3196**

SUBJECT INDEX **I-1**

PERSONAL AUTHOR INDEX **I-75**

CORPORATE SOURCE INDEX **I-83**

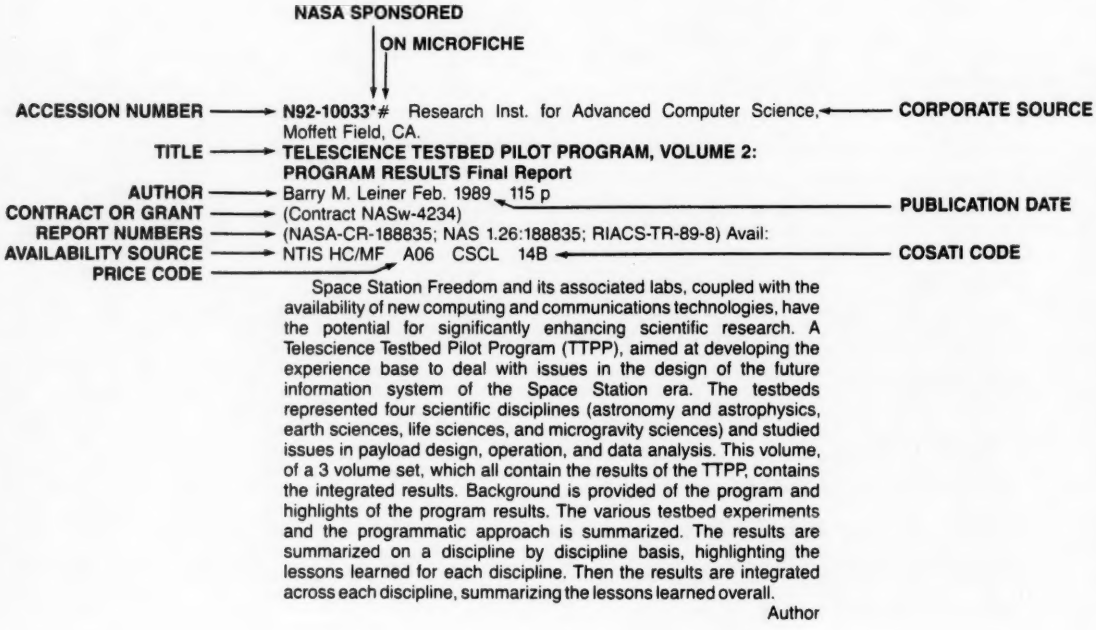
CONTRACT NUMBER INDEX **I-97**

REPORT NUMBER INDEX **I-99**

ACCESSION NUMBER INDEX **I-105**

APPENDIX **A-1**

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED
ON MICROFICHE
ACCESSION NUMBER
N92-10033*# Research Inst. for Advanced Computer Science, Moffett Field, CA.
CORPORATE SOURCE
TITLE
TELESCIENCE TESTBED PILOT PROGRAM, VOLUME 2: PROGRAM RESULTS Final Report
AUTHOR
Barry M. Leiner Feb. 1989 115 p
PUBLICATION DATE
CONTRACT OR GRANT
(Contract NASw-4234)
REPORT NUMBERS
(NASA-CR-188835; NAS 1.26:188835; RIACS-TR-89-8) Avail:
AVAILABILITY SOURCE
NTIS HC/MF A06 CSCL 14B
COSATI CODE
PRICE CODE
Space Station Freedom and its associated labs, coupled with the availability of new computing and communications technologies, have the potential for significantly enhancing scientific research. A Telescience Testbed Pilot Program (TTPP), aimed at developing the experience base to deal with issues in the design of the future information system of the Space Station era. The testbeds represented four scientific disciplines (astronomy and astrophysics, earth sciences, life sciences, and microgravity sciences) and studied issues in payload design, operation, and data analysis. This volume, of a 3 volume set, which all contain the results of the TTPP, contains the integrated results. Background is provided of the program and highlights of the program results. The various testbed experiments and the programmatic approach is summarized. The results are summarized on a discipline by discipline basis, highlighting the lessons learned for each discipline. Then the results are integrated across each discipline, summarizing the lessons learned overall.
Author

VOLUME 30 NUMBER 18 / SEPTEMBER 23, 1992

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N92-27887# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Guidance and Control Panel.

AIR VEHICLE MISSION CONTROL AND MANAGEMENT

Mar. 1992 260 p In ENGLISH and FRENCH The 53d symposium was held in Amsterdam, Netherlands, 22-25 Oct. 1991 (AGARD-CP-504; ISBN-92-835-0662-6) Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Presented here are 21 unclassified papers presented at the Guidance and Control Panel Symposium held at the Marine Kazerne, Amsterdam, The Netherlands from October 22 to 25, 1991. Topics covered include operational mission considerations, situation assessment, route planning, mission planning, expert systems, aircraft guidance and control, fuzzy logic, flight control, and trajectories. For individual titles, see N92-27888 through N92-27907.

N92-27888# Royal Air Force, London (England). Combat Operations Centre.

INTERDICTION MISSION PLANNING AND CO-ORDINATION DURING THE GULF CONFLICT 17 JANUARY - 27 FEBRUARY 1991 **c66**

V. A. Mee and P. J. Goodman *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 5 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The Gulf Air War started for Royal Air Force Tornado GR1 aircraft with the delivery of JP 233 weapons from low level at night. After sustaining unacceptable losses at low level, tactics changed to delivery of freefall 1000 lb bombs from medium level, at first by night and then by day. Accuracies, however, improved dramatically with the arrival in theatre of precision guided munitions. Described here is a typical mission covering all aspects from initial tasking by ATO, through mission planning and coordination with intelligence input to deconfliction and mission execution. Missions were flown as co-ordinated packages, Tornado GR1's being supported by F15C fighter escorts with EW support from F4G 'Wild Weasels' and EF111 'Raven' aircraft. Mission planning by the Royal Air Force was manpower intensive and could have been streamlined with the availability of more automated systems. Several lessons were learned from the conflict, which are listed and discussed. Author

N92-27889# Physics and Electronics Lab. TNO, The Hague (Netherlands).

AIRPOWER PLANNING AND BATTLE MANAGEMENT TRAINING AT AIRBASE LEVEL **c66**

P. Schulein and R. F. W. M. Willems *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 9 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Airborne or Ground-Based Pilot Mission Planning is a single important link in the chain of activities that is required to facilitate operating airpower from an airbase. Other elements of that chain include Target Recce and Allocation and Sortie Generation. It turns out that information management problems associated with intelligence generation, also apply to effectively controlling Sortie Generation, both to make most efficient use of scarce resources and to generate an organization that is able to benefit from Pilot Mission Planning improvements. An obvious solution to improving an information management problem is designing a Command, Control Communications and Information System (C3IS). To improve design and development of these C3I systems, it is proposed to combine the design of those systems and the use of Battle Management Training Systems. Developing operational and training systems together has possibilities to increase user involvement and acceptance and incorporate studies towards not only just fielding a C3I system, but looking at the most effective combination of System and Organization. As a case, the design of the Airbase Operations Wargame for the Royal Netherlands Airforce is presented and some conclusions are drawn regarding the possible use of this system in designing C3I systems such as the Airbase Command and Control Information System ABCCIS. Author

N92-27890# Alenia, Torino (Italy). Div. Avionica ed Apparati Speciali.

AUTOMATED TARGET TRACKING AND LOCATION TECHNIQUES APPLIED TO OPTICAL PAYLOADS ON REMOTELY PILOTED VEHICLES **c05**

Mario Audenino, Antonio Gaglio, and Paolo Faggion *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 14 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The ALENIA Mini-Remotely Piloted Vehicle (RPV) System has the capability to perform different missions; one of the most useful missions is to provide real-time target acquisition (detection, recognition, identification and location) from the battlefield. When the target has been identified, the Mini RPV System within the GCS processes data arriving from the air vehicle and with the aid of digital terrain maps gives the target location by determining geographical coordinates and altitude. Target location is calculated using the vector from the air vehicle to the target and the RPV present position. The RPV to target vector information relative to air vehicle body coordinate is derived from sensor LOS data acquired using a stabilized platform. This platform permits target tracking irrespective of air vehicle motion. With present on-board electronics and digital terrain maps, the target location accuracy is approximately 50 meters CEP. Author

N92-27891# Thomson-CSF, Bagneux (France).

AIR SITUATION ESTABLISHMENT IN A MOBILE MULTISENSOR ENVIRONMENT **c66**

C. Rivierre and M. Desbois *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 5 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The impact of the mobility concept on an air command and control system is discussed. The subject is limited to the air picture establishment. Various aspects linked with mobility are pointed out as well as solutions to handle the additional difficulty at the

data fusion level. These solutions are based on an original experience, on experiment results, and on study work. Advanced system capabilities which make more intensive use of airborne platforms, are also discussed. Author

N92-27892*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SITUATION ASSESSMENT IN THE PALADIN TACTICAL DECISION GENERATION SYSTEM c66
John W. McManus, Alan R. Chappell (Lockheed Engineering and Sciences Co., Hampton, VA.), and P. Douglas Arbuckle *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 16 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A 12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Paladin is a real-time tactical decision generator for air combat engagements. Paladin uses specialized knowledge-based systems and other Artificial Intelligence (AI) programming techniques to address the modern air combat environment and agile aircraft in a clear and concise manner. Paladin is designed to provide insight into both the tactical benefits and the costs of enhanced agility. The system was developed using the Lisp programming language on a specialized AI workstation. Paladin utilizes a set of air combat rules, an active throttle controller, and a situation assessment module that have been implemented as a set of highly specialized knowledge-based systems. The situation assessment module was developed to determine the tactical mode of operation (aggressive, defensive, neutral, evasive, or disengagement) used by Paladin at each decision point in the air combat engagement. Paladin uses the situation assessment module; the situationally dependent modes of operation to more accurately represent the complex decision-making process of human pilots. This allows Paladin to adapt its tactics to the current situation and improves system performance. Discussed here are the details of Paladin's situation assessment and modes of operation. The results of simulation testing showing the error introduced into the situation assessment module due to estimation errors in positional and geometric data for the opponent aircraft are presented. Implementation issues for real-time performance are discussed and several solutions are presented, including Paladin's use of an inference engine designed for real-time execution. Author

N92-27893# Institute of Aviation Medicine, Farnborough (England).
A TEAMWORK MODEL OF PILOT AIDING: PSYCHOLOGICAL PRINCIPLES FOR MISSION MANAGEMENT SYSTEMS DESIGN c66
R. M. Taylor and S. J. Selcon *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 14 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Advances in automation and control/display technology have enabled design effort to focus on how aircrew system interfaces can be created to help perform the mission and to help solve mission problems. Evidence of this development towards a concept of aiding the pilot, rather than replacing pilot functions, comes from recent systems proposed for both ground and airborne mission control and management. Interface design solutions for aircrew systems problems usually evolve pragmatically, based on considerations of convenience, availability, utility, familiarity and operator acceptance. Currently, there is no substantial theory of the pilot-aiding concept. In the absence of a theoretical basis, pilot-aiding interfaces for mission control and management will lack theoretical consistency and they will be without any formal, systematic procedures for establishing design criteria, goals and objectives. Some of the consequences of this will be sub-optimal utilization of system function, loss of situational awareness, a low level of pilot trust, and failure to reduce pilot workload. In order to address the requirements for a theory of the pilot-aiding concept, we propose a model based on the principles of teamwork, where the human and 'electronic' crew components work co-operatively towards achieving mission objectives. Characteristics of the model are incorporated into a prototype tool for auditing the quality of interface design solutions with respect to teamwork criteria. Teamwork audits are reported for several aircrew systems, including pilot aids for mission control and management, in order to test the validity of the model, and to establish its sensitivity and diagnostic power. Conclusions are drawn about interface design requirements affecting pilot-aiding and mission performance. Author

N92-27894*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
STATUS OF AUTOMATIC GUIDANCE SYSTEMS FOR ROTORCRAFT IN LOW ALTITUDE FLIGHT c04
Banavar Sridhar, Victor H. L. Cheng, and Harry N. Swenson *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 12 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Rotorcraft operating in high-threat environments fly close to the earth's surface to utilize surrounding terrain, vegetation, or man-made objects to minimize the risk of being detected by an enemy. The piloting of the rotorcraft is at best a very demanding task and the pilots need help from on-board automation tools in order to devote more time to mission-related activities. The Automated Nap-of-the-Earth (NOE) Flight Program is a cooperative NASA/Army program aimed at the development of technologies for enhancing piloted low-altitude/NOE flight path management and control through computer and sensor aiding. The long-term objective is to work towards achieving automation for aiding the pilot in NOE flight with a flight demonstration of resulting computer/sensor aiding concepts at an established course. The technology for pilot-centered NOE automation is not currently available. Success in automating NOE functions will depend on major breakthroughs in real-time flight path planning algorithms, effective methods for the pilot to interface to the automatic modes, understanding of visual images, sensor data processing/fusion, and sensor development. Our approach to developing the technologies required to solve this problem consist of the following phases: (1) algorithm development, (2) laboratory evaluation, (3) piloted ground simulation, and (4) evaluation in flight. An overview of the research in this area at NASA Ames Research Center is given. Author

N92-27895# Universitaet der Bundeswehr Muenchen, Neubiberg (Germany, F.R.). Inst. fuer Systemdynamik und Flugmechanik.
KNOWLEDGE-BASED PLANNING FOR CONTROLLED AIRSPACE FLIGHT OPERATION AS PART OF A COCKPIT ASSISTANT c04
T. Prevot, R. Onken, and H.-L. Dudek (Dornier System G.m.b.H., Friedrichshafen, Germany, F.R.) *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 8 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A knowledge based computer aid for flight planning tasks as part of a Cockpit Assistant for IFR (Instrument Flight Rules) operation is presented in detail after a brief overview of the modular structure of the Cockpit Assistant has been given. Based upon the requirements of air traffic management, the system is aimed at supporting the pilot in complex planning and decision situations. By assessing the situation, flight goal conflicts are detected and avoided by offering sensible flight plan modifications to the pilot. The main features of the situation assessment and planning module are discussed with regard to knowledge representation and applied solution model. Thus, conflict detection, selection of an alternate destination and rerouting algorithms are described in detail. The present state of implementation, as tested in a flight simulation facility at the University of the German Armed Forces in Munich, is presented as well as some results of the test phase with professional pilots. The possibilities of integrating the system into the avionics of modern aircraft are discussed and an outlook is given of expanding it towards 4-D and RNAV capability and/or

optimal 3-D aircraft trajectory planning under constraints from terrain, traffic and weather. Author

N92-27896# Naval Air Development Center, Warminster, PA.
COMPARISON OF THE EVENT-STEP ALGORITHM TO OTHER PATH PLANNING METHODS TO AVOID DYNAMIC 3D OBSTACLES **c04**
Mark Silbert *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 9 p Revised (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

In a previous paper, the Event-Step Algorithm (ESA) was presented as an efficient path planning algorithm to avoid dynamic obstacles. Dynamic obstacles are defined as obstacles that move and/or distort over time. Here, the focus is more closely on the algorithm; it is compared with other path planning algorithms. Specifically, Grid Search, Voronoi Graph and Visibility Graph methods are considered. It is shown that the ESA offers advantages over these methods and is a generalization and improvement of the Visibility Graph method. A summary of the ESA is presented. Author

N92-27897# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany, F.R.). Inst. of Flight Guidance.
ON BOARD PLANNING OF 4D-TRAJECTORIES **c04**
V. Adam and R. Kohrs *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 12 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The evolution of present day Air Traffic Management (ATM) towards an integrated Air Traffic Management will lead to the introduction of computer based planning systems on the ground side, which communicate with advanced Flight Management Systems onboard the aircraft via automatic data link. An experimental Flight Management System (EFMS) is under development in the frame of the PHARE program for research into future ATM concepts. This EFMS will have the capability to predict a 4-dimensional trajectory according to a set of constraints given by an ATC planning computer on the ground. It will negotiate this trajectory with ATC via data link and will generate appropriate guidance commands for the autopilot/autothrottle system to steer the aircraft along this trajectory. The functionality of the EFMS is described as well as the planning strategy for the generation of a trajectory from the departure to the destination airport which meets the defined constraint attributes. Author

N92-27898# Honeywell, Inc., Minneapolis, MN. Systems and Research Center.
TRAJECTORY OPTIMIZATION FOR HYPERSONIC AIRCRAFT GUIDANCE **c04**
R. L. Schultz, M. J. Hoffman, A. M. Case, and S. I. Sheikh *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 16 p Sponsored by AFWAL (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A computationally efficient, real-time trajectory optimization and guidance approach for hypersonic aircraft is described. The optimization approach is based on Euler-Lagrange energy state approximations. A three-dimensional, spherical-earth, aircraft-motion model with constraints on temperature, dynamic pressure, acceleration, and angle of attack is employed. Climb-to-orbit, return-from-orbit, flight-to-designated-landing-site, unpowered-abort, and powered-abort flight conditions are considered. Different performance criterion are used for different problems. Solution methods of varying computational complexity and performance capability are developed. An exact solution to the optimization problem using iteration on adjoint variables is developed. This method is the most exact but is not suitable for on-board processing. However, it serves as the basis of performance comparison for the approximate methods. Approximate solution methods suitable for onboard guidance are developed for the climb-to-orbit problem and the flight-to-a-landing site problem. A computationally efficient method for generating footprints is described. Footprints are used to determine when to start final descent and to identify candidate landing sites under an air-breathing-engine or rocket-engine abort or other emergency conditions. A hypersonic-vehicle guidance, navigation, and control configuration of the complete optimal guidance scheme is described. Sensitivity analysis results are included for climb-to-orbit trajectories. The probability of achieving orbit using the optimal guidance scheme and a stored nominal approach are compared. Author

N92-27899# Mitre Corp., Bedford, MA.
TECHNOLOGY AND STANDARDS FOR A COMMON AIR MISSION PLANNER **c66**
Ellen K. Kriegel and Joseph K. DeRosa *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 17 p Sponsored by AFSC (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The USAF Electronics System Division (ESD) is currently developing a common air mission planner in a phased program for multiple aircraft and weapons. It is called Air Force Mission Support System (AFMSS) and will be used by the Strategic Air Command, Tactical Air Forces, Military Airlift Command, and Special Operations Forces of the United States. Discussed are the common elements that constitute the core of that mission planning system, as well as the accommodation of unique elements for each different aircraft. The open system architecture concept is established, and the technology trends and standards that drive the architecture are defined. Performance issues are discussed, and the Common Mapping System is presented. Finally, future challenges in mission planning systems are discussed. Author

N92-27900# Mitre Corp., Bedford, MA.
SEARCH ROUTE PLANNING **c04**
J. R. VanZandt *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 14 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Planning an airborne search for a relocatable target involves minimizing the risk to the crew while maximizing the estimated likelihood of finding targets. When the number of potential sites is small, the problem reduces to finding the best (usually the shortest) route connecting them. The aircraft need not overfly each site, but must only come within sensor range of it. Thus, the search route planning problem can be modeled as a covering salesman problem (CSP) -- a generalization of the traveling salesman problem in which the tour need not visit every city, but every city must be within a certain distance of some city on the tour. The spacefilling curve heuristic for the traveling salesman problem is demonstrated, then a new heuristic for the covering salesman problem is presented and applied to the search route planning problem. When the number of sites is large, the planner must also decide which subset of them can be visited. A genetic algorithm has been developed for selecting both a set of sites to visit and an appropriate routing pattern. The procedure also accounts for the finite turning radius of the aircraft. Author

N92-27901# Electronic System G.m.b.H., Munich (Germany, F.R.).
AN EFFICIENT METHOD FOR THREE-DIMENSIONAL ROUTE PLANNING WITH DIFFERENT STRATEGIES AND CONSTRAINTS **c04**
U. Leuthaeusser and F. Raupp *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 5 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A method for planning paths through a digital map is presented. The task consists of planning 3-dimensional paths for autonomous

air vehicles over a terrain represented by a digital map with different strategies and constraints. Possible strategies minimize time, danger, or fuel consumption. Constraints are lateral, and vertical maximum accelerations as well as time and fuel constraints. The path planning problem can be viewed as a shortest path problem (geodesic problem) in a space with a non-Euclidean metric depending on the applied strategy. One has to minimize a cost functional giving rise to the Hamilton-Jacobi equation which is solved by Dynamic Programming techniques. Because of the digitization bias, a second optimization step consisting of direct optimization methods is sometimes necessary. The result is a fast, non-heuristic and flexible technique for strategic route planning. Author

N92-27902# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Wessling (Germany, F.R.). Inst. for Flight Systems Dynamics.

OPTIMAL GUIDANCE ANTICIPATING MISSILE PERFORMANCE **c15**

W. Grimm and K. H. Well *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 13 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Two different guidance methods are designed for the pre-launch phase in a one-versus-one air combat situation with missiles. In both guidance schemes a missile/target simulation is performed to estimate the miss distance at the end of a fictitious missile launch. A way to do this in real time is described. The first guidance method continuously evaluates the miss distance for each aircraft against the respective opponent. The guidance is such that the ratio of the rates of the miss distances takes an optimal value from the view of the guided aircraft. Thus, it reaches a firing opportunity first. The purpose of the second guidance method is to reach a firing position against a nonmaneuvering target in minimum time. Inside the guidance algorithm, the optimal pre-launch trajectory is approximated by nonlinear programming. It serves as a reference trajectory for the guidance. In simulations the influence of different missile and target strategies in the post-launch phase is examined. The comparison with an optimal trajectory shows the near-optimal character of the guidance method. Author

N92-27903# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain). Lab. de Guiado.

FUZZY GUIDANCE SYSTEM EVALUATION **c61**

J. R. Martin, F. Sanchez, P. V. Cuenca, L. M. Rodriguez, and J. B. Ecija *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 15 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A study is described that compares the capability of a fuzzy logic controller with a classical controller P+D (proportional plus derivative). The model used for this investigation is the attitude control of a microsatellite launcher, during the first stage of flight. This model has been chosen because it performs on a very unstable plant; the launcher is conceived without stabilization surfaces and only the body is considered as a generator of aerodynamics forces. Movable-nozzle Thrust Vector Control (TVC) will be used as a flight control device. The problem is studied under three degrees of freedom simulation at two levels, software and hardware. The concept formulated in this work is the analysis of the fuzzy rules that perform robust control during the flight. It has been used on perturbations, a wind profile and misalignments in the launcher. The wind model generates a wind velocity vector, which is constant throughout each run. The wind velocity vector is parallel to the surface of the earth. Author

N92-27904# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.

PARALLEL KNOWLEDGE BASED SYSTEMS ARCHITECTURES FOR IN-FLIGHT MISSION MANAGEMENT **c04**

M. R. Bowyer and S. A. Cross *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 12 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The focus here is on the architectural approach, both in hardware and software, taken for the parallel DMuse project, and its applications to in-flight mission management. This includes a description of the Muse Real Time Intelligent Knowledge Based System (IKBS) toolkit as it now stands and the alterations necessary to provide this system on a multi-processor platform to produce the Distributed Muse (DMuse) toolkit. Author

N92-27905# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany, F.R.). Inst. of Flight Guidance.

IMPLEMENTATION AND OPERATIONAL EXPERIENCE WITH A NEW ARRIVAL TRAFFIC MANAGEMENT SYSTEM AT THE FRANKFURT ATC-CENTER **c04**

M. Schubert and U. Voelckers *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 17 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The DLR-Institute for Flight Guidance had developed a new Arrival Traffic Management System called COMPAS (Computer Oriented Metering Planning Advisory System). The system has been implemented at the Frankfurt Regional Air Traffic Control Center in mid 1989 and is in continuous operation since then. A comprehensive implementation plan was developed in order to guarantee a smooth introduction, in particular with respect to both technical issues and controller acceptance. The experience gained and the lessons learned during the implementation process as well as the operational results are reported. Author

N92-27906# McDonnell Aircraft Co., Saint Louis, MO.

ICAAS PILOTED SIMULATION EVALUATION **c06**

R. P. Meyer, R. J. Landy, and D. J. Halski *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 16 p (For primary document see N92-27887 18-01)

Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Described here are the Integrated Control and Avionics for Air Superiority (ICAAS) piloted simulation evaluations, along with the system development leading up to the simulations and the data analysis plan for evaluating simulation results. The ICAAS advanced development program is sponsored by the United States Air Force Wright Laboratory at Wright Patterson Air Force Base, Ohio. A research and development contract was awarded to the McDonnell Aircraft Company, St. Louis, Missouri, in September 1987. The program objective is to develop, integrate and demonstrate critical technologies which will enable United States Air Force tactical fighter 'blue' aircraft to kill and survive when outnumbered as much as four to one by enemy 'red' aircraft during air combat engagements. Primary emphasis is placed on beyond visual range (BVR) combat with provisions for effective transition to close-in combat. An overview is given of the ICAAS system and its functions. The hardware elements needed to implement the ICAAS system are described and require high throughput parallel processing Reduced Instruction Set Computer (RISC) computers and an advanced 'glass' cockpit. The development of the ICAAS system is discussed as it moved from rapid prototyping to unit testing of attack management and flight Management software and finally into hardware software integration testing prior to manned simulation. The Data Analysis plan for reducing piloted simulation results to assess system performance is described. The evaluation of the ICAAS system performance encompasses not only integrated system performance but also performance of individual ICAAS subsystems as they are reflected by measures of. situation awareness, flight management utilization, weapon utilization and sensor effectiveness. This includes use of multiple measures of performance as well as univariate and multivariate analyses to assess ICAAS system performance. Author

N92-27907*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.
FROM AN AUTOMATED FLIGHT-TEST MANAGEMENT SYSTEM TO A FLIGHT-TEST ENGINEER'S WORKSTATION
c61
E. L. Duke, R. W. Brumbaugh, M. D. Hewett, and D. M. Tartt (G and C Systems, Inc., San Juan Capistrano, CA.) *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 12 p
(For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Described here are the capabilities and evolution of a flight-test engineer's workstation (called TEST PLAN) from an automated flight-test management system. The concept and capabilities of the automated flight-test management system are explored and discussed to illustrate the value of advanced system prototyping and evolutionary software development. Author

N92-27929* National Aeronautics and Space Administration, Washington, DC.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 277)
Apr. 1992 137 p
(NASA-SP-7037(277); NAS 1.21:7037(277)) Avail: NTIS HC A07; NTIS standing order as PB92-914100, A04

This bibliography lists 467 reports, articles, and other documents introduced into the NASA scientific and technical information system in Mar. 1992. Subject coverage includes: the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines); and associated aircraft components, equipment, and systems. It also includes research and development in ground support systems, theoretical and applied aspects of aerodynamics, and general fluid dynamics. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N92-27344# Institute for Aerospace Research, Ottawa (Ontario).
TRAJECTORIES AND STABILITY OF TRAILING VORTICES VERY NEAR THE GROUND [TRAJECTORIES ET STABILITE DES VORTEX DE BOUT D'AILE A PROXIMITE DU SOL]
A. M. Drummond, R. Onno, and B. Panneton Dec. 1991 57 p
(NRC-32151; IAR-AN-74; CTN-92-60537) Avail: NTIS HC/MF A04

The behavior of the trailing vortices of a Harvard aircraft used as the spraying vehicle during a set of experiments in aerial spraying over flat terrain for agricultural applications is discussed. The aircraft flew at a nominal altitude of 10 feet above ground at a speed of 110 knots. The stability and trajectory of a chosen element of the trailing vortices were measured by analyzing movie films taken by a ground-based camera and by a helicopter mounted camera at 800 feet above the aircraft. The vortices decayed by core bursting in every case and the time to burst was usually in agreement with other published data for a light aircraft out of ground effect. The downwind vortex almost always burst before the upwind vortex and in most cases both vortices exhibited about the same amount of rebound even though the downwind vortex generally had a shorter lifetime. The classical inviscid theory for vortex descent was not a good model for these experiments but it was able to predict, with some success, the lateral separation between the vortices when the aircraft wingtip height was arbitrarily reduced by a factor of 0.85. It was concluded that vortex core bursting and rebound must be included in any procedure for calculating aerial spray deposit on the ground. Author (CISTI)

N92-27376*# Toledo Univ., OH.
USERS MANUAL AND MODELING IMPROVEMENTS FOR AXIAL TURBINE DESIGN AND PERFORMANCE COMPUTER CODE TD2-2 Final Report
Arthur J. Glassman Mar. 1992 29 p
(Grant NAG3-1165; RTOP 505-69-50)
(NASA-CR-189118; E-6828; NAS 1.26:189118) Avail: NTIS HC/MF A03

Computer code TD2 computes design point velocity diagrams and performance for multistage, multishaft, cooled or uncooled, axial flow turbines. This streamline analysis code was recently modified to upgrade modeling related to turbine cooling and to the internal loss correlation. These modifications are presented in this report along with descriptions of the code's expanded input and output. This report serves as the users manual for the upgraded code, which is named TD2-2. Author

N92-27377*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
TURBULENT HEAT FLUX MEASUREMENTS IN A TRANSITIONAL BOUNDARY LAYER
K. H. Sohn, K. B. M. Q. Zaman, and E. Reshotko (Case Western Reserve Univ., Cleveland, OH.) Apr. 1992 20 p
(Contract NCC3-124; RTOP 505-62-52)
(NASA-TM-105623; E-6962; NAS 1.15:105623) Avail: NTIS HC/MF A03

During an experimental investigation of the transitional boundary layer over a heated flat plate, an unexpected result was encountered for the turbulent heat flux (bar-v't'). This quantity, representing the correlation between the fluctuating normal velocity and the temperature, was measured to be negative near the wall under certain conditions. The result was unexpected as it implied a counter-gradient heat transfer by the turbulent fluctuations. Possible reasons for this anomalous result were further investigated. The possible causes considered for this negative bar-v't' were: (1) plausible measurement error and peculiarity of the flow facility, (2) large probe size effect, (3) 'streaky structure' in the near wall boundary layer, and (4) contributions from other terms usually assumed negligible in the energy equation including the Reynolds heat flux in the streamwise direction (bar-u't'). Even though the energy balance has remained inconclusive, none of the items (1) to (3) appear to be contributing directly to the anomaly. Author

N92-27399*# Eloret Corp., Sunnyvale, CA.
AN EXPERIMENTAL INVESTIGATION OF THE SEPARATING/REATTACHING FLOW OVER A BACKSTEP Progress Report, 1 Sep. 1991 - 29 Feb. 1992
Srboljub Jovic 23 Jun. 1992 17 p
(Contract NCC2-465)
(NASA-CR-190426; NAS 1.26:190426) Avail: NTIS HC/MF A03

Transport characteristics of the turbulent kinetic energy, k, and the shear stream, bar(-uv), were studied in an incompressible boundary layer downstream of the reattachment of the separated flow behind a backward facing step. Hot-wire measurement techniques were used to measure three Reynolds stresses and higher order mean products of velocity fluctuations. These quantities were used to evaluate advection, turbulent diffusion, and production terms of the k and bar(-uv) transport equations. The dissipation rate and pressure-strain terms were obtained as the difference of all the other terms. The Reynolds number based on the step height was 37,000 and the upstream oncoming flow was fully developed turbulent boundary layer with the R(sub theta) = 3600. H.A.

N92-27558*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
MODELING OF HEAVY-GAS EFFECTS ON AIRFOIL FLOWS Final Report
Mark Drela 11 May 1992 54 p
(Grant NAG2-708)
(NASA-CR-190357; NAS 1.26:190357) Avail: NTIS HC/MF A04

Thermodynamic models were constructed for a calorically

imperfect gas and for a non-ideal gas. These were incorporated into a quasi one dimensional flow solver to develop an understanding of the differences in flow behavior between the new models and the perfect gas model. The models were also incorporated into a two dimensional flow solver to investigate their effects on transonic airfoil flows. Specifically, the calculations simulated airfoil testing in a proposed high Reynolds number heavy gas test facility. The results indicate that the non-idealities caused significant differences in the flow field, but that matching of an appropriate non-dimensional parameter led to flows similar to those in air. Author

N92-27624# Toronto Univ. (Ontario).
PITCH-HEAVE DYNAMICS MODELS FOR AN AIR CUSHION VEHICLE Ph.D. Thesis
Terence Arthur Graham 8 Mar. 1989 379 p
(ISBN-0-315-51095-1; CTN-92-60471) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The pitch-heave dynamics of an air cushion vehicle with an uncompartmented segmented skirt system were investigated through experiments on two craft and through simulation. The experiments show that this type of craft can exhibit a pure heave instability at higher fan speeds and a combined pitch-heave instability when released from large initial pitch angles. The response in both cases is strongly affected by the type of material used in the skirt. Results presented show that the heave instability is strongly affected by skirt material extensibility which allows cushion volume and exit-airflow area modulation with cushion pressure. The volume modulation gives an additional cushion capacitance which is seen to decrease the stability whereas the airflow area modulation increases stability. The important skirt-related factors in the dynamics of the segmented skirt cushion are determined through a simulation of the nonlinear dynamics and a linearized analysis. Both the nonlinear and linearized analyses include a detailed model of the skirt geometry which uses an elastic membrane model of the skirt. The simulation results show that the pitch-heave instability occurs as a result of coupling which arises from the dependence of the exit-airflow area geometry on both the pitch and heave position. The static hysteresis models produce enough damping to suppress the instability at small initial angles but not larger ones, as seen in the experiments.
Author (CISTI)

N92-27706# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Fluid Dynamics Panel.
SPECIAL COURSE ON SKIN FRICTION DRAG REDUCTION
Mar. 1992 284 p Course held in Rhode-Saint-Genese, Belgium, 2-6 Mar. 1992; sponsored in cooperation with VKI
(AGARD-R-786; ISBN-92-835-0661-8) Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Lecture notes for the AGARD Fluid Dynamics Panel (FDP) Special Course on 'Skin Friction Drag Reduction' have been assembled in this report. The aim and scope of this course was to provide an overview of the state of the art of current technology programs focused on reducing aircraft drag caused by skin friction. This report provides a review of recent progress in the field of skin friction drag reduction for transport aircraft. It provides a general introduction to the technology and then focuses on two specific aspects of drag reduction: maintaining laminar flow by controlling transition and manipulating the turbulence structure in boundary layers to help reduce skin friction. Technology associated with the use of riblets, LEBU, polymers, additives, etc., is also reviewed. For individual titles, see N92-27707 through N92-27714.

N92-27707# Centre d'Etudes et de Recherches, Toulouse (France).
BASIC CONCEPTS ON BOUNDARY LAYERS
Jean Cousteix *In* AGARD, Special Course on Skin Friction Drag Reduction Mar. 1992 39 p (For primary document see N92-27706 18-02)
Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

At the present time drag reduction is an industrial challenge in aeronautics which justifies the efforts devoted to this topic. One facet of this effort deals with the skin friction drag reduction. Two directions are followed. The first one is the manipulation of turbulent boundary layers, by altering the formation of turbulence or by modifying its characteristics it is hoped to decrease the turbulent skin friction. The second direction concerns the action on laminar-turbulent transition, by delaying the occurrence of the turbulent regime, enormous skin friction reductions are possible. It is believed that the improvements in the field are based on a better knowledge of the basic phenomena. Author

N92-27708# Airbus Industrie, Blagnac (France).
DRAG REDUCTION: AN INDUSTRIAL CHALLENGE
J. P. Robert *In* AGARD, Special Course on Skin Friction Drag Reduction Mar. 1992 15 p (For primary document see N92-27706 18-02)
Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Over the last few decades all civil aircraft manufacturers have made great efforts to reduce aircraft drag. The long term aim of the operation is to reduce the specific fuel consumption of aircraft, the potential reduction of over 10 percent would represent savings of several million dollars for the airlines. The fuel crises have increased the need for developing new technologies to be applied on the new aircraft; retrofits, however, also have their uses. Estimating the drag of a transport aircraft through calculation or wind tunnel tests must come as close as possible to the value obtained in flight. H.A.

N92-27709* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AIRCRAFT DRAG REDUCTION
D. M. Bushnell *In* AGARD, Special Course on Skin Friction Drag Reduction Mar. 1992 16 p (For primary document see N92-27706 18-02)
Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

This paper reviews aerodynamic drag reduction for friction, wave and vortex drag associated with supersonic cruise aircraft and suggests approaches and research directions which cover the spectrum from possibly significant to revolutionary. Various synergisms are also included, especially in regard to suction laminar flow control and flow separation control at cruise. The former may also enable improved low speed, high lift systems, lift to drag ratio for subsonic cruise, reduced parasitic viscous drag for favorable interference wave drag reduction approaches, and turbulent skin friction reduction via slot injection. Flow separation control at cruise proffers opportunities for increased leading edge thrust, increased lift increment from upper surface, increased fuselage lift/camber for wave drag due to lift reduction, improved performance of various favorable interference wave drag reduction schemes, as well as possibly better low speed, high-schemes and wing cruise performance. More speculative approaches include multi-stage aircraft, thrust vectoring for lift augmentation, as well as trim, and a number of conceptual wave and vortex drag reduction schemes. Author

N92-27710# Arizona State Univ., Tempe. Dept. of Mechanical and Aerospace Engineering.
LAMINAR-TURBULENT TRANSITION: FUNDAMENTALS
William S. Saric *In* AGARD, Special Course on Skin Friction Drag Reduction Mar. 1992 32 p (For primary document see N92-27706 18-02)
Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The basic instability mechanisms are discussed from an elementary standpoint considering only boundary layers in external flows. The objective of this report is to provide the basic ideas and results of boundary layer stability in order that one can

understand transition mechanics, transition control, and transition prediction for aircraft systems. The current state of the art boundary layer stability is reviewed and by using recent results, it is shown that a number of unique transition mechanisms exist and each play a different role in the breakdown to turbulence. The control of the stability and transition characteristics of a particular flow field requires thoroughly understanding the details of these breakdown mechanisms. Author

N92-27711# Centre d'Etudes et de Recherches, Toulouse (France). Dept. of Aerothermodynamics.
BOUNDARY LAYER TRANSITION: PREDICTION, APPLICATION TO DRAG REDUCTION
D. Arnal *In* AGARD, Special Course on Skin Friction Drag Reduction Mar. 1992 59 p (For primary document see N92-27706 18-02)
Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

This paper describes the practical calculation methods which are currently available to predict the transition location in two and three dimensional flows. Emphasis is given to the problem of skin friction drag reduction on swept wings at subsonic and transonic speeds. The so called e(sup n) method, which is deduced from the linear stability theory is widely used in the case of 'natural' transition, but simpler techniques (empirical criteria) are useful in more complex situations such as boundary layer tripping or leading edge contamination. The simulation of flight in wind tunnels is also discussed. Wind tunnel/flight correlation includes comparisons between the free stream disturbance environment, the transition Reynolds number, and the n factor at transition onset. Author

N92-27712# University of Southern California, Los Angeles. Dept. of Aerospace Engineering.
THE EDDY STRUCTURES IN BOUNDED SHEAR FLOWS
Ron F. Blackwelder *In* AGARD, Special Course on Skin Friction Drag Reduction Mar. 1992 18 p (For primary document see N92-27706 18-02)
(Contracts N00014-82-K-0084; N00014-86-K-0679; F49620-85-C-0080)
Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The near wall turbulent eddies consist of streamwise vortices, low speed streaks, intense shear layers, inflectional velocity profiles, oscillations and ejections of low speed fluid out into the logarithmic layer. Away from the wall, large scale three dimensional outer structures dominate the flow. A mass of data has been accumulated over the past 25 years concerning these eddies and their interaction. These eddies and events will be discussed as well as their Reynolds number dependence. Author

N92-27713*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
STUDY OF TURBULENCE STRUCTURE THROUGH NUMERICAL SIMULATIONS: THE PERSPECTIVE OF DRAG AND REDUCTION
J. J. Kim *In* AGARD, Special Course on Skin Friction Drag Reduction Mar. 1992 14 p (For primary document see N92-27706 18-02)
Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The first part of this note concerns organized structures in the near-wall region of a turbulent boundary layer. A particular emphasis is given to those organized motions believed to be responsible for the turbulence production process in the wall region, and hence, indirectly responsible for the viscous drag. Examples are selected to illustrate how the analyses of numerically generated databases have contributed to improve our understanding of the organized structures of turbulent boundary layers. In the second part, results from an exploratory study based on the direct numerical simulation of the concepts for active control of turbulent boundary layers are presented. A significant drag reduction is achieved when the surface boundary condition is modified such that it could suppress the organized motion in the wall region. This drag reduction is accompanied by a significant reduction in the intensity of the organized structures and in the magnitude of Reynolds stresses throughout the flow. Author

N92-27714# Centre d'Etudes et de Recherches, Toulouse (France). Aerothermodynamics Dept.
TURBULENT SKIN-FRICTION DRAG REDUCTION BY ACTIVE AND PASSIVE MEANS, PART 1
E. Coustols and A. M. Savill (Cambridge Univ., England) *In* AGARD, Special Course on Skin Friction Drag Reduction Mar. 1992 80 p Sponsored in part by Rolls-Royce Ltd.; Cambridge Univ.; Airbus Industrie; Aerospatiale; British Aerospace Aircraft Group; BACC; and BMT (For primary document see N92-27706 18-02)
(Grants SERC-GR/E/06824; SERC-GR/E/77039)
Copyright Avail: NTIS HC/MF A13; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The purpose of this paper is to provide a current overview of turbulent skin friction drag reduction concepts which have potential for reducing aircraft fuel consumption. These lectures are organized around four topics. First, after briefly reviewing what is known about the structure of the turbulent boundary layer, possible mechanisms for both active and passive will be discussed; concentrating on techniques offering net drag benefits, either through inner or outer layer manipulation. Both experimental and numerical results will be presented for these boundary layer manipulators. Available data and computer model predictions for low and high subsonic speeds, transonic conditions, and supersonic flow will be reviewed. The aim will be to outline the most important results obtained in terms of drag reduction, and to emphasize the most recent developments. Finally, the combination of passive devices with polymers, suction, blowing, microbubbles, or acoustic forcing will be discussed along with studies of alternative drag reducing surfaces. Author

N92-27936# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Structures and Materials Panel.
TRANSONIC UNSTEADY AERODYNAMICS AND AEROELASTICITY
Mar. 1992 396 p In ENGLISH and FRENCH The 73d meeting was held in San Diego, CA, 7-11 Oct. 1991 Original contains color illustrations
(AGARD-CP-507; ISBN-92-835-0660-X) Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Given here are papers presented at a Specialists' Meeting organized by the Structures and Materials Panel of AGARD and held at its Fall 1991 Meeting. Topics covered include transonic unsteady aerodynamics, aeroelasticity, various methods of calculation, and engineering-level aeroelastic prediction techniques. For individual titles, see N92-27937 through N92-27962.

N92-27937*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
CURRENT STATUS OF COMPUTATIONAL METHODS FOR TRANSONIC UNSTEADY AERODYNAMICS AND AEROELASTIC APPLICATIONS
John W. Edwards and John B. Malone *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 24 p Previously announced as N92-21432 (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The status of computational methods for unsteady aerodynamics and aeroelasticity is reviewed. The key features of challenging aeroelastic applications is discussed in terms of the flowfield state - low angle high speed flows and high angle vortex dominated flows. The critical role played by viscous effects in determining aeroelastic stability for conditions of incipient flow separation is stressed. The need for a variety of flow modeling

tools, from linear formulations to implementations of the Navier-Stokes equations, is emphasized. Estimates of computer run times for flutter calculations using several computational methods are given. Applications of these methods for unsteady aerodynamic and transonic flutter calculations for airfoils, wings, and configurations are summarized. Finally, recommendations are made concerning future research directions. Author

N92-27938*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
UNSTRUCTURED-GRID METHODS DEVELOPMENT FOR UNSTEADY AERODYNAMIC AND AEROELASTIC ANALYSES
John T. Batina, Elizabeth M. Lee, William L. Kleb, and Russ D. Rausch (Purdue Univ., West Lafayette, IN.) *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 10 p Previously announced as N91-32084 (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The current status of unstructured grid methods developed in the Unsteady Aerodynamics Branch at NASA Langley Research Center is described. These methods are being developed for unsteady aerodynamic and aeroelastic analyses. Flow solvers that have been developed for the solution of unsteady Euler equations are highlighted. The results demonstrate two and three dimensional applications for both steady and unsteady flows. Comparisons are also made with solutions obtained using a structured grid code and with experimental data to determine the accuracy of the unstructured grid methodology. These comparisons show good agreement which thus verifies the accuracy. Author

N92-27939# Wright Lab., Wright-Patterson AFB, OH. Aeroelasticity Group.
UNSTEADY AERODYNAMICS FOR AEROELASTICITY AT THE FLIGHT DYNAMICS DIRECTORATE
M. Blair, L. J. Huttsell, W. A. Sotomayer, and T. M. Harris *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 10 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

An overview is presented of the recent in-house and contractual efforts in the area of transonic unsteady aerodynamics for aeroelasticity at the Flight Dynamics Directorate of the USAF Wright Laboratory. Three major topics are discussed. The first topic, analytical unsteady aerodynamics, involves the application of both transonic small disturbance and Euler/Navier-Stokes codes to fighter-type aircraft. Aeroelastic calculations made with these codes are compared with test results. The second topic involves a description of unsteady pressure testing in the NLR tunnel in the Netherlands. Finally, the plan for incorporating transonic unsteady aerodynamics into structural redesign is presented. Author

N92-27940# Saab Aircraft Co., Linkoping (Sweden). Dept. of Aeroelasticity.
RECENT APPLICATIONS OF LINEAR AND NONLINEAR UNSTEADY AERODYNAMICS FOR AEROELASTIC ANALYSIS
Bengt Winzell *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 10 p Sponsored in part by Swedish Defence Administration (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Results of unsteady linear and full potential theory are used for analysis of wings and aircraft configurations. In particular, the details of unsteady pressure distributions at the trailing edge are investigated, aiming at better representation of control surface hinge moments. The importance of viscous effects are observed and a comparison between potential theory and Navier-Stokes predictions is made. Author

N92-27941# Alberta Univ., Edmonton. Dept. of Mathematics.
A TIME-LINEARIZATION APPROACH FOR UNSTEADY TRANSONIC FLOWS
Y. S. Wong, B. H. K. Lee, and H. S. Murty (Ottawa Univ., Ontario) *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 22 p Sponsored by Dept. of National Defence and Natural Sciences and Engineering Research Council (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The development of a time-linearization approach for solving the unsteady transonic small disturbance equation is described in UST3D simulation code (UnSteady Transonic code for a 3D isolated wing). The accuracy of the method was examined by comparing the unsteady pressure distributions with those obtained from XTRAN3S code and experiments carried out on the F-5 wing at subsonic and transonic wings to show the deficiencies of the method. Using the UST3D code, flutter analysis was carried out on the AGARD 445.6 wing. The flutter boundaries were compared with experimental results and those from CAP-TSD code. Author

N92-27942# Rome Univ. (Italy).
A BOUNDARY INTEGRAL FORMULATION FOR UNSTEADY TRANSONIC POTENTIAL FLOWS
U. Iemma, F. Mastroddi, L. Morino, and M. Pecora (Alenia Spazio S.p.A., Rome, Italy) *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 11 p Sponsored by Italian Aerospace Research Center (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A boundary integral formulation for the analysis of unsteady potential transonic flows around airplanes is presented. The formulation is applied to steady and to unsteady two dimensional and three dimensional configurations under the small perturbation assumption. The results are compared with existing numerical and/or experimental results, and demonstrate that the algorithm is capable of capturing shocks. However, the location predicted appears to be ahead of that predicted by conservative finite difference schemes; nevertheless, considering the preliminary nature of this work, the agreement obtained is quite satisfactory. Author

N92-27943# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (Germany, F.R.). Inst. of Aeroelasticity.
COMPARISON OF EULER AND FULL POTENTIAL METHODS FOR UNSTEADY TRANSONIC FLOW CALCULATIONS
R. Voss and W. Wegner *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 17 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Presented here are the results of unsteady transonic flow calculation methods developed at the DLR Institute of Aeroelasticity for oscillating airfoils and wings. The 2D Euler and Full Potential calculations in the nonlinear regime with pronounced shock dynamics at the conventional NACA0012 and the supercritical NLR7301 airfoil show that the unsteady pressure distributions agree well, whereas the unsteady lift and moment curves are not always in good agreement. The 3D results are obtained with a 3D Full potential code and a 3D time linearized TSD method for a swept NACA0012 wing and for a LANN wing, an AGARD standard test wing, both oscillating with small amplitudes. The agreement of the first harmonics of pressure distribution indicates that the time linearized approach may be sufficient for low amplitudes. For higher amplitudes, however, the appearance of pronounced higher harmonics indicates strong nonlinear behavior combined with complicated shock motions. Author

N92-27944# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (Germany, F.R.). Inst. of Aeroelasticity.

COMPUTATION OF THE UNSTEADY TRANSONIC 2D CASCADE FLOW BY AN EULER ALGORITHM WITH INTERACTIVE GRID GENERATION

V. Carstens *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 14 p (For primary document see N92-27936 18-02)

Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Numerical results of a code for computing the unsteady transonic flow in a 2D cascade of harmonically oscillating blades are given. The calculation of the flow field is based on a Euler code using flux vector splitting. After a description of the basic equations and the special numerical techniques applied to the code, results are presented for the first harmonics of pressure, lift, and moment coefficients. For the present investigations, two basic oscillation modes were chosen: tuned modes where all blades perform oscillations with the same frequency, same amplitude and a constant interblade phase angle, and mistuned modes, where all blades are oscillating with the same amplitude, but with varying frequency from one blade to another. The computed results refer to two standard configurations: a subsonic-transonic turbine cascade and a subsonic-transonic compressor cascade. In the case of tuned bending modes, the theoretical results are compared with the experimental data from the turbine standard configuration. Special attention is directed to the occurrence of aerodynamic instability in the oscillating cascade. It can be shown that the interblade phase angles at which the above mentioned experimental test case shows unstable behavior are generally well-reproduced by the computational results. Author

N92-27945# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany, F.R.). Military Aircraft Div.

EVALUATION OF AN UNSTEADY IMPLICIT EULER CODE AGAINST TWO AND THREE-DIMENSIONAL STANDARD CONFIGURATIONS

A. Brenneis and A. Eberle *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 15 p (For primary document see N92-27936 18-02)

Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The numerical simulation of the unsteady Euler equations in conservative form for time-accurate problems using a relaxation method is considered. The unfactored implicit equations are solved by applying a nonlinear Newton method. Relaxation is performed with a point Gauss-Seidel algorithm ensuring a high degree of vectorization by employing the so-called checkerboard scheme. The fundamental feature of the Euler solver is a characteristic variable splitting scheme (Godunov-type averaging procedure, linear locally one-dimensional Riemann solver) based on an Eigenvalue analysis for the calculation of fluxes. Singular behavior of the coefficient matrix is evaded by a simple matrix conditioning needing only a few operations. Numerical results are presented for two and three dimensional standard AGARD configurations. The airfoils and wings at sub and transonic flows perform harmonically pitching oscillations or trailing edge flap oscillations. Comparisons with experiments show good agreement except in regions where viscous effects are evident. Author

N92-27946# Escuela Tecnica Superior de Ingenieros Aeronauticos, Madrid (Spain).

UNSTEADY TRANSONIC AERODYNAMICS OF POINTED BODIES OF REVOLUTION IN SUPERSONIC FREESTREAM

P. GarciaFogeda and A. Sanz *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 9 p Sponsored by Polytechnical Univ. of Madrid (For primary document see N92-27936 18-02)

Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A method was developed to determine the aerodynamic forces acting on oscillating bodies of revolution in transonic-supersonic flight. The nonlinear equation for the mean flow perturbation potential and the time linearized equation for the cross flow perturbation are both of hyperbolic type, for the Mach number range of interest, and have been solved by the method of characteristics. The method is valid for arbitrary frequencies of oscillation and can be applied for rigid or flexible body motions. Results are presented for the stability force coefficients, unsteady pressure distributions, and shock deformations for various body shapes and Mach numbers. Author

N92-27947# National Aerospace Lab., Amsterdam (Netherlands).

NLR INVISCID TRANSONIC UNSTEADY LOADS PREDICTION METHODS IN AEROELASTICITY

M. H. L. Hounjet *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 16 p Sponsored in part by Royal Dutch Airforce (For primary document see N92-27936 18-02)

(Contract NIVR-01904N)

Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

An overview is presented of unsteady inviscid calculation methods at the National Aerospace Laboratory (NLR), which are primarily based on the full potential equation for the prediction of airloads on oscillating structures in transonic flow. Attention is given to experience with entropy/vorticity corrections and a procedure which removes the frequency barrier associated with time-linearized modelings. This procedure has a favorable effect on computer cost such that transonic flutter boundaries can be obtained in acceptable turn-around times on current workstations. A method for transonic aeroelastic analysis of complete aircraft which is now in the stage of development is introduced, and attention is given to its grid generation procedure. The methods are demonstrated by showing results of unsteady loads and pressure coefficients applications in 2D and 3D transonic flow and an aeroelastic application to a 3D AGARD standard aeroelastic case in transonic flow. Author

N92-27948# Dornier Luftfahrt G.m.b.H., Friedrichshafen (Germany, F.R.). Numerical Fluid Mechanics Div.

COMPUTATIONS OF UNSTEADY FLOWS AROUND AIRFOIL SECTIONS BY EXPLICIT AND IMPLICIT METHODS SOLVING THE EULER AND NAVIER-STOKES EQUATIONS

Edgar A. Gerteisen *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 13 p (For primary document see N92-27936 18-02)

Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A Euler/Navier Stokes solution algorithm is presented for unsteady aerodynamic analysis of flows around airfoil sections. Several numerical methods have been involved in the flow solver, beginning with an explicit Runge-Kutta time-stepping scheme. Two methodological closely connected moving mesh algorithms were implemented, concerning the mesh adaption for improved accuracy with a minimal number of mesh points, and the body conforming mesh movement which is completely general and can treat realistic configurations. A description is given of the latest version of the developed implicit solving algorithm which can be used as a direct method, but also includes an option for iterating the unsteady residual to enhance the time accuracy. The included moving mesh methods for solution adapting and body conforming the grid are summarized. Numerical simulations of steady and unsteady well known flow phenomena, comprising a shock/boundary interaction, a flow around a cylinder, an airfoil with oscillating flap, and a circular arc airfoil substantiate the above mentioned topics. Author

N92-27949# Deutsche Airbus G.m.b.H., Bremen (Germany, F.R.). Dept. Aeroelastics.

COMPUTATION OF VISCOUS PHENOMENA IN UNSTEADY TRANSONIC FLOW

U. R. Mueller, H. Henke, and K. Dau *In* AGARD, Transonic

Unsteady Aerodynamics and Aeroelasticity Mar. 1992 16 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Progress towards the development of a 3D viscous-inviscid strong interaction method for computing unsteady transonic wing flow is reported. In the current version, an ADI technique for solving the 3D unsteady Transonic Small Perturbation (TSP) equation has been extended by incorporating an unsteady 2D integral boundary layer method and then simultaneously solving the viscous and inviscid flow equations in a stripwise fashion. Here attention is focused on the viscous part of the method, and a 3D boundary layer version is introduced. Detailed calculations of 2D unsteady and 3D incompressible/compressible turbulent boundary layers were performed by the integral methods and also by a finite difference solver, and the results are compared to experimental data. The strong interaction technique is validated by comparison with experimental pressure distributions on several airfoils and a wing for various transonic Mach numbers. For steady and unsteady flows, the computed influence of viscous displacement on the pressure distribution is demonstrated in contrast to purely inviscid calculations. Author

N92-27950# British Aerospace Aircraft Group, Kingston-upon-Thames (England). Military Aircraft Div.
TRANSONIC AEROELASTIC CALCULATIONS IN BOTH THE TIME AND FREQUENCY DOMAINS
M. J. Knott *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 8 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A method for exploring the flutter characteristics of wing-only configurations in the transonic flow regime is presented. At the heart of the method is the Unsteady Transonic Small Perturbation (UTSP) program, which solves the nonlinear transonic small perturbation equation with or without the simultaneous integration of the structural equations of motion. The aim here is to describe the functionality of the program, with a particular emphasis on its implementation within the existing aeroelastics analysis environment at the Kingston site of British Aerospace. Before demonstrating the use of the UTSP program on a production conbat wing, results for the AGARD Taileron and wing 445.6 models are presented, with the aim of validating the method. Author

N92-27951# McDonnell Aircraft Co., Saint Louis, MO.
AEROELASTIC CALCULATIONS FOR FIGHTER AIRCRAFT USING THE TRANSONIC SMALL DISTURBANCE EQUATION
Dale M. Pitt and Dennis F. Fuglsang *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 11 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The Transonic Small Disturbance (TSD) equation provides a fast and efficient tool for calculating both static and dynamic nonlinear aerodynamic effects. To become an accepted part of the aircraft design process, time-accurate TSD equation solvers for aeroelastic calculations now need to be evaluated on realistic aircraft configurations that have complex geometry. Discussed here is the application of NASA Langley's Computational Aeroelastic Program - Transonic Small Disturbance (CAP-TSD) code for both static and dynamic transonic aeroelastic calculations for McDonnell Aircraft Company's F-15 and F/A-18 fighter aircraft. The results for flutter speed and aileron reversal speed are compared with results from standard linear aerodynamic analysis. Author

N92-27952# Deutsche Airbus G.m.b.H., Bremen (Germany, F.R.). Dept. Aeroelastics.
COMPUTATION OF FLUTTER BOUNDARIES IN THE TIME AND FREQUENCY DOMAIN
H. Zimmermann, S. Vogel, H. Henke, and B. Schulze *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 9 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Computations of flutter boundaries in the time and frequency domain are presented using an interactive 3D Transonic Small Perturbation code. Results of conventional flutter calculations in the frequency domain are opposed to those of flutter simulations integrating the aerodynamic and structural equations of motion simultaneously in the time domain. Highlighted here are the basic properties of these two approaches and the results for a six and a two degrees of freedom model. A comparison of generalized airloads determined by harmonic and pulse excitation is presented. Author

N92-27953# Boeing Co., Seattle, WA.
ANALYSIS OF UNSTEADY AERODYNAMIC AND FLUTTER CHARACTERISTICS OF AN AEROELASTIC MODEL IN TRANSONIC FLOW
G. SenGupta, C. J. Borland, F. T. Johnson, J. E. Bussoletti, R. G. Melvin, D. P. Young, M. B. Bieterman, and P. A. Palotas *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 18 p Original contains color illustrations (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Prediction of unsteady pressure distributions is an important step towards analyzing the flutter characteristics of an airplane. For this purpose, the TRANSAIR code, originally developed for predicting steady transonic flow past bodies of complex geometry, was extended to handle unsteady problems, in which the unsteady solution could be viewed as an harmonic perturbation to the steady transonic flow. The predicted unsteady flow effects were compared with linear solutions for subsonic flow problems. The predicted results were also compared with available experimental data on unsteady pressure distributions on an oscillating wing in transonic flow. In all these cases, excellent agreements were obtained. The unsteady TRANSAIR code and a structural finite element code were then used to analyze the flutter characteristics of a three dimensional wing model. The predicted flutter speeds and frequencies, including nonlinear flow effects were significantly different than those predicted by linear analysis. Further analyses including the effects of nacelles and fuselage bodies are in progress. Author

N92-27954# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DIRECT COUPLING OF FLUID STRUCTURE IN TRANSONIC AEROELASTICITY [COUPLAGE DIRECT FLUIDE STRUCTURE EN AEROELASTICITE TRANSSONIQUE]
J. P. Grisval and J. L. Meurzec *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 14 p In FRENCH; ENGLISH summary Previously announced in IAA as A91-16744 (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Presented here is a numerical approach for transonic aeroelasticity studies called the direct coupling method. This direct coupling is realized between the computation of aerodynamic forces and the computation of displacements. The flow is modeled by using the Transonic Small Perturbation (TSP). In steady flow, we determine the static deformations of the structure. The strong coupling insures the equilibrium state between the aerodynamic forces and the static deformations and in the steady flow between the aerodynamic and the aeroelastic forces in the time domain. The analysis of the resulting displacements give the evolution of the structural modes and enable us to detect flutter. Numerical results are presented for a civil aircraft and are compared with other methods in the frequency domain. Author

N92-27955*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
INVESTIGATION OF THE AEROELASTIC STABILITY OF THE AFW WIND-TUNNEL MODEL USING CAP-TSD

Walter A. Silva and Robert M. Bennett *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 11 p Previously announced as N92-11977 (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The Computational Aeroelasticity Program - Transonic Small Disturbance (CAP-TSD) code is applied to the Active Flexible Wing (AFW) wind tunnel model for prediction of the model's transonic aeroelastic behavior. A semi-span computational model is used for evaluation of symmetric motions and a full span model is used for evaluation of antisymmetric motions. Static aeroelastic solutions using CAP-TSD are computed. Dynamic flutter analyses are then performed as perturbations about the static aeroelastic deformations and presented as flutter boundaries in terms of Mach number and dynamic pressure. Flutter boundaries that take into account modal refinements, vorticity, and entropy corrections, antisymmetric motions and sensitivity to the modeling of the wing tip ballast stores are also presented and compared with experimental flutter results. Author

N92-27956# National Aerospace Lab., Tokyo (Japan). Structural Mechanics Div.
NUMERICAL SIMULATION OF SHOCK-STALL FLUTTER OF AN AIRFOIL USING THE NAVIER-STOKES EQUATIONS c08
K. Isogai *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 12 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

In order to confirm, qualitatively, the unusual flutter phenomenon, which has been observed experimentally for the high aspect ratio (non-tailored) forward swept wing model, as a shock-stall flutter, the aeroelastic response calculation of a two dimensional airfoil whose vibration characteristics are similar to those of the typical section of a forward swept wing, was performed by using the compressible Navier-Stokes equations as a flow solver. By the examination of the flow pattern, pressure distribution and the behavior of the unsteady aerodynamic forces during the diverging oscillation of the airfoil, it is concluded that this is a shock-stall flutter, in which the large scale shock-induced flow separation is playing the dominant role and that there is a mechanism of putting energy into the elastic system of the airfoil, leading to nearly a single degree of freedom flutter. Author

N92-27957*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
TRANSONIC AEROELASTIC COMPUTATIONS ON WINGS USING NAVIER-STOKES EQUATIONS
Guru P. Guruswamy and Shigeru Obayashi *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 22 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Aeroelastic computations are made on fighter type wings in the transonic regime. The flow is modeled using the Navier-Stokes equations and is coupled with structural equations of motion. The flow equations are solved by a time accurate finite difference scheme with moving grids. The coupled aeroelastic equations of motion are solved using the linear acceleration method. The configuration adaptive dynamic grids are time-accurately generated using the aeroelastically deformed shape of the wing. Computations are made for oscillating rigid wings with moving shock waves in the presence of leading edge vortices. The computed results compare well with the experiment. Unsteady computations are made to demonstrate the shock-vortex interaction phenomenon on wings in ramp motion. Effects of flexibility and pitch rate are demonstrated for flows with vortices. Author

N92-27958# National Aerospace Lab., Amsterdam (Netherlands).
DEVELOPMENT OF A METHOD TO PREDICT TRANSONIC LIMIT CYCLE OSCILLATION CHARACTERISTICS OF FIGHTER AIRCRAFT c08
J. J. Meijer and A. M. Cunningham, Jr. (General Dynamics Corp., Fort Worth, TX.) *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 21 p Sponsored in part by AF and General Dynamics Corp. (For primary document see N92-27936 18-02)
(Contract NIVR-07801N)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

An analysis of steady wind tunnel data obtained for a fighter type aircraft indicated that shock-induced and trailing edge separation plays a dominant role in the development of Limit Cycle Oscillations (LCO) at transonic speeds. On this basis, a semi-empirical LCO prediction method is being developed which makes use of such steady wind tunnel data. The preliminary method was applied to several configurations and correctly identified those which have encountered LCO. The method has the potential for application early in the design process of new aircraft to determine and understand these nonlinear aeroelastic characteristics. The method is still being evaluated, and upgrading and refinements are expected from unsteady wind tunnel force and pressure measurements to be obtained from oscillating models as part of an extensive investigation into the aerodynamic nature of LCO. The method is described in its present form and the results of the latest predictions are compared with flight results and used to further assess various parametric effects. Author

N92-27959# General Dynamics Corp., Fort Worth, TX.
TRANSONIC WIND TUNNEL INVESTIGATION OF LIMIT CYCLE OSCILLATIONS ON FIGHTER TYPE WINGS
Atlee M. Cunningham, Jr. and Ruud G. denBoer (National Aerospace Lab., Amsterdam, Netherlands) *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 14 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A wind tunnel investigation was conducted to investigate the unsteady aerodynamic aspects of transonic Limit Cycle Oscillations (LCO) on fighter type aircraft wings. The first test, conducted with a wing body configuration with wing stores, was restricted to incidences below 10 deg. Test results are presented with the objective of obtaining unsteady pressure and forces necessary for identifying the aerodynamic nature of transonic LCO which is currently encountered on many fighter configurations. The wing panel was oscillated in pitch at amplitudes and frequencies typical of LCO for flow conditions in which significant shock-induced separation is encountered. Unsteady pressure data were obtained for the wing panel in terms of both harmonic components and time-histories to highlight the nonlinearities. Unsteady forces and moments measured on the wing panel as well as on each wing store were also obtained to indicate the level of contribution of each element to the overall unsteady wing loads for pitching motions. Author

N92-27960*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE BENCHMARK AEROELASTIC MODELS PROGRAM: DESCRIPTION AND HIGHLIGHTS OF INITIAL RESULTS
Robert M. Bennett, Clinton V. Eckstrom, Jose A. Rivera, Jr., Bryan E. Dansberry, Moses G. Farmer, and Michael H. Durham *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 11 p Previously announced as N92-15049 (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

An experimental effort was implemented in aeroelasticity called the Benchmark Models Program. The primary purpose of this program is to provide the necessary data to evaluate computational

fluid dynamic codes for aeroelastic analysis. It also focuses on increasing the understanding of the physics of unsteady flows and providing data for empirical design. An overview is given of this program and some results obtained in the initial tests are highlighted. The tests that were completed include measurement of unsteady pressures during flutter of a rigid wing with an NACA 0012 airfoil section and dynamic response measurements of a flexible rectangular wing with a thick circular arc airfoil undergoing shock boundary layer oscillations. Author

N92-27961# Queens Univ., Belfast (Northern Ireland).
FURTHER INVESTIGATION OF THE EFFECT OF MODEL COOLING ON PERIODIC TRANSONIC FLOW
S. Raghunathan, F. Zarifi-Rad, and D. G. Mabey (Royal Aerospace Establishment, Bedford, England) *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 13 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

An experimental investigation of the effect of model cooling on transonic periodic flows on biconvex airfoils is reported. The test conditions included shock interactions with laminar and turbulent boundary layers at a Reynolds number of 0.9 million and model wall temperature to tunnel total temperature ratios 0.5 to 1.0. The results show large effects of model cooling on transonic periodic flows. The effects observed are thought to correspond to what would happen at high Reynolds numbers at adiabatic wall temperatures. Author

N92-27962# Royal Aerospace Establishment, Bedford (England). Aerodynamics Dept.
A REVIEW OF SCALE EFFECTS ON SURFACES IN UNSTEADY MOTION
D. G. Mabey *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 19 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The importance of scale effects is recognized generally in steady aerodynamics but is often ignored in unsteady aerodynamics. An attempt is made to remedy this situation by the compilation of a review of information on the influence of Reynolds number from a wide range of unsteady aerodynamic tests, with particular reference to wing flows. The unsteady tests considered here relate to surfaces in unsteady motion and include dynamic tests of airfoils and wings, pressure measurements, oscillatory control surface derivatives, and stability derivatives. Here, it is suggested that for the recommended model conditions with fixed transition, scale effects are small for fully attached or well-separated flows, but may be close to incipient separation. With fixed transition, extrapolation from model to full-scale Reynolds numbers is usually possible. In contrast, with free transition, scale effects can be large for both attached and separated flows, and extrapolation from model to full-scale Reynolds numbers is usually extremely difficult. Some test cases for the prediction of scale effects in unsteady aerodynamics are suggested. Author

N92-28102*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
COMPARATIVE STUDY OF TURBULENCE MODELS IN PREDICTING HYPERSONIC INLET FLOWS
Kamlesh Kapoor, Bernhard H. Anderson, and Robert J. Shaw Jul. 1992 17 p Proposed for presentation at the 28th Joint Propulsion Conference and Exhibit, Nashville, TN, 6-8 Jul. 1992; sponsored by AIAA, SAE, ASME, and ASEE Original contains color illustrations
(RTOP 505-62-40)
(NASA-TM-105720; E-7116; NAS 1.15:105720; AIAA-92-3098)
Avail: NTIS HC/MF A03; 1 functional color page

A numerical study was conducted to analyze the performance of different turbulence models when applied to the hypersonic NASA P8 inlet. Computational results from the PARC2D code, which solves the full two-dimensional Reynolds-averaged Navier-Stokes equation, were compared with experimental data. The zero-equation models considered for the study were the Baldwin-Lomax model, the Thomas model, and a combination of the Baldwin-Lomax and Thomas models; the two-equation models considered were the Chien model, the Speziale model (both low Reynolds number), and the Launder and Spalding model (high Reynolds number). The Thomas model performed best among the zero-equation models, and predicted good pressure distributions. The Chien and Speziale models compared very well with the experimental data, and performed better than the Thomas model near the walls. Author

N92-28151# National Aerospace Lab., Tokyo (Japan). Aircraft Aerodynamics Div.
NACA0012 AIRFOIL DATA CORRECTED FOR SIDEWALL BOUNDARY-LAYER EFFECTS IN THE NAL TWO-DIMENSIONAL TRANSONIC WIND TUNNEL
Norikazu Sudani, Hiroshi Kanda, Mamoru Sato, Shigeo Baba, Hitoshi Miwa, and Kenichi Matsuno Sep. 1991 75 p
(NAL-TM-640T; ISSN-0452-2982; JTN-92-80377) Avail: NTIS HC/MF A04

An experimental study of NACA0012 airfoils at transonic speeds was conducted in order to acquire aerodynamic data for evaluating sidewall boundary layer effects. Measurements primarily consisted of static pressure on the airfoil and drag force coefficients determined using the wake rake. The tests were performed at free stream Mach numbers from approximately 0.65 to 0.8, at angles of attack from -2.0 deg to 2.0 deg, and at Reynolds numbers (based on airfoil chord) from 7(10)(exp 6) to 40(10)(exp 6). Mach number corrections for sidewall boundary layer effects were made, and tests were subsequently performed on two different chord airfoils to confirm the applicability of the correction to different airfoil aspect ratios. This is a supplementary report; it presents both uncorrected and corrected data which enables comparative studies to be conducted using computational fluid dynamics and other wind tunnel experimental results. Author (NASDA)

N92-28152# National Aerospace Lab., Tokyo (Japan). Control Systems Div.
ESTIMATION OF CABLE-MOUNTED MODEL INERTIA CHARACTERISTICS FOR DYNAMIC WIND-TUNNEL TEST
Masaaki Yanagihara, Masahiko Nagayasu, Shuuichi Sasa, and Takashi Shimomura Oct. 1991 43 p In JAPANESE; ENGLISH summary
(NAL-TM-641; ISSN-0452-2982; JTN-92-80378) Avail: NTIS HC/MF A03

The inertia characteristics of a cable mounted spaceplane model (1:20 scale), that is used for dynamic wind tunnel tests, were experimentally estimated. The estimated parameters consisted of the vertical position of the model's center of gravity, the inertia moments I(sub x), I(sub y) and I(sub z), and the product of inertia I(sub xz). The method was based on a bifilar pendulum system and estimation errors were evaluated. As a result, the moment of inertia I(sub y) and I(sub z) were estimated within approximately +/-1 percent error, although I(sub x) and the product of inertia I(sub xz) had larger errors. An analysis of the estimation error confirmed that the errors for I(sub x) and I(sub xz) can be improved by using a smaller suspension rig. Author (NASDA)

N92-28190# National Aerospace Lab., Tokyo (Japan). Aircraft Aerodynamics Div.
FORCE MEASUREMENTS ON AGARD CALIBRATION MODEL-B AT TRANSONIC SPEEDS IN THE NAL TWO-DIMENSIONAL WIND TUNNEL
Mamoru Satou, Hiroshi Kanda, Norikazu Sudani, Shigeo Baba, Hitoshi Miwa, and Iwao Kawamoto Aug. 1991 15 p In JAPANESE; ENGLISH summary
(NAL-TM-639; ISSN-0552-2982; JTN-92-80376) Avail: NTIS HC/MF A03

In order to investigate the capability of conducting force measurements of three dimensional (3-D) models in NAL's two dimensional (2-D) wind tunnel, force measurements on AGARD calibration Model-B (Mach numbers: from 0.5 to 1.1, Reynolds

number: 3 x 10(exp 6) and 4 x 10(exp 6)). Full and half models were tested. Four different strut lengths having a circular arc cross section and stings were used to install the full model. For the half model, a plate was installed to remove the effects of the wind tunnel's sidewall boundary layer, as well as adding a small gap between the model and the plate to remove the effects of the plate's boundary layer. It was shown that force measurements of 3-D models are possible in NAL's 2-D wind tunnel, although improvements in the struts and stings are necessary to conduct tests at Mach numbers greater than 0.85. Author (NASDA)

N92-28192# National Aerospace Lab., Tokyo (Japan). Aircraft Aerodynamics Div.
A GUST GENERATION METHOD FOR FULL CONFIGURATION AIRCRAFT TESTS IN A LOW SPEED WIND TUNNEL. PART 1: DESIGN AND PRELIMINARY EXPERIMENTS
Seizou Suzuki, Sigeo Kayaba, Tadao Sawai, and Norimasa Yoshida Jun. 1991 40 p In JAPANESE; In JAPANESE; ENGLISH summary
(NAL-TR-1115-Pt-1; ISSN-0389-4010; JTN-92-80383) Avail: NTIS HC/MF A03

A gust generation method is described that uses vortices produced from four oscillating cantilever wings which were installed in a low speed wind tunnel upstream of the test section. In order to obtain uniform pulsating flow at the test model, the aspect ratio of the rectangular wings was theoretically determined. Preliminary experiments validation were performed in a pilot tunnel with results indicating a suitable design method which is appropriate for application in NAL's 6.5 m x 5.5 m Low Speed Wind Tunnel. Author (NASDA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N92-27682# Wright Lab., Wright-Patterson AFB, OH.
FOREIGN OBJECT DAMAGE TO TIRES OPERATING IN A WARTIME ENVIRONMENT Final Report, Jan. 1987 - Dec. 1990
Kenneth P. Schwartz Nov. 1991 68 p
(AD-A247195; WL-TR-91-3014) Avail: NTIS HC/MF A04

Over the past 5 years, various efforts addressed the problems associated with Foreign Object Damage (FOD) to aircraft operating in a debris strewn environment following an airbase attack. These efforts include engine object ingestion probability, engine (FOD) damage, aircraft damage from tire lofted foreign objects, external stores FOD, tire cutting FOD, and the operability of tires subjected to FOD. This report was written to provide a summary and preliminary assessment to the tire cutting FOD portion of the overall post-attack FOD program. The report summarizes the approach and results of tests on over 126 aircraft tires which were tested in a simulated post-attack environment under full scale test conditions. Test tires included F-16 main and nose, and an F-4 nose tire setup. Test variables included speed, load, size, pressure, tire type, turning, water effects, debris type, debris size, debris distribution, braking, and combined variable effects. Analysis consideration involved cut types, cut depths, number of cuts, cut/hit probabilities, tire failures, and aircraft operational impacts. GRA

N92-27750# Army Aviation Test Board, Fort Rucker, AL.
INGRESS, EMERGENCY EGRESS, AND EMERGENCY EVACUATION TESTING OF ARMY AIRCRAFT Final Report
30 Sep. 1991 23 p
(AD-A246398) Avail: NTIS HC/MF A03

This test operation procedure (TOP) specifies procedures for testing ingress, emergency egress, and emergency evacuation of Army aircraft. Components installed on the interior and exterior of the aircraft as well as personnel equipment may adversely affect ingress and egress from an aircraft. The inherent design of a particular aircraft may also contribute to the time required to egress safely depending on the number of crew doors and exits designated as emergency evacuation routes. The criteria in appendix B provide guidelines for maximum times allowed for emergency egress and emergency evacuation. GRA

N92-27914# Federal Aviation Administration, Washington, DC. Office of Aviation Medicine.
HUMAN FACTORS EVALUATION OF THE WORK ENVIRONMENT OF OPERATORS ENGAGED IN THE INSPECTION AND REPAIR OF AGING AIRCRAFT
Richard I. Thackray Jan. 1992 16 p
(AD-A246445; DOT/FAA/AM-92/3) Avail: NTIS HC/MF A03

Site evaluations of air carriers and repair stations conducting inspections and heavy maintenance on PART 121 aging aircraft were conducted during 1989-90 under the Federal Aviation Administration's (FAA's) Office of Flight Standards Aging Fleet Evaluation Program. This report presents the findings of the human factors portion of this program in which aspects of the work environment of selected operators were evaluated with respect to illumination levels, noise, temperature/ventilation, work support equipment/workspace adequacy, occupational safety, and extent of worker overtime. Data are reported for 19 site evaluations. While 89 percent of the operators were given global ratings of acceptable or better in the area of human factors, the deficiencies noted were quite consistent across carriers and repair stations. Illumination levels, in particular, were found to be considerably below levels recommended by the Illuminating Engineering Society. There were also deficiencies in work support equipment and in compliance with the operator's stated safety program. Recommendations are given for improvements in each of these areas. GRA

N92-28052# Systems Control Technology, Inc., Arlington, VA.
COMPOSITE PROFILES OF HELICOPTER MISHAPS AT HELIPORTS AND AIRPORTS Final Report
L. D. Dzamba, W. T. Sampson, III, and R. J. Adams Jan. 1992 92 p
(Contract DTFA01-87-C-0014)
(AD-A248887; SCT-91RR-31; DOT/FAA/RD-91/1) Avail: NTIS HC/MF A05

In a companion report entitled Analysis of Helicopter Mishaps at Heliports, Airports, and Unimproved Sites, DOT/FAA/RD-90/8, National Transportation Safety Board and U.S. Army mishap reports were reviewed in order to determine the types of mishaps that have occurred at helicopter landing sites. Based upon these mishap records, helicopter composite mishap profiles were developed and are presented here in order to demonstrate the types of mishaps that have occurred at or near heliports and airports. Each composite profile includes a description of the mishap, facility design factors which contributed to the mishap, nondesign-related contributing factors, and operational safety enhancements where appropriate. This document is intended to be a learning and teaching aid. The intended audience includes helicopter landing area designers, managers, and operators, as well as pilots. The goal of the report is to broaden awareness in the helicopter community in order to promote safety. This report is one in a series of three dealing with helicopter mishaps at landing sites. The other reports are: Analysis of Helicopter Mishaps at Heliports, Airports and Unimproved Sites, DOT/FAA/RD-90/8, and Analysis of Helicopter Accident Risk Exposure near Heliports, Airports, and Unimproved Sites, DOT/FAA/RD-90/9. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *Communications and Radar.*

N92-27217# Naval Postgraduate School, Monterey, CA.
NATIONAL AIRSPACE DATA INTERCHANGE NETWORK ANALYSIS M.S. Thesis
Guy M. Esten Mar. 1992 96 p
(AD-A247345) Avail: NTIS HC/MF A05

This thesis is a description and analysis of the Federal Aviation Administration's National Airspace Data Interchange Network (NADIN). The Objective is to define, for telecommunications students, this data interchange network and examine the effect which current network upgrades will have on network performance. Descriptions of the current Data Interchange Network (NADIN IA) and the next generation Data Interchange Network (NADIN II) are included as well as information on related FAA programs, most notably the Radio Communications Link (RCL). Analysis is presented of NADIN II's impact on the Federal Aviation Administration's Data Interchange capabilities. Implementation problems with NADIN II are addressed. Conclusions include the economic soundness of NADIN II due to leased line savings and a strong recommendation to the NADIN II program manager to aggressively pursue full project funding. GRA

N92-27916# Krug Life Sciences, Inc., San Antonio, TX.
REFERENCE MODE EFFECT ON THE AUDITORY DISPLAY OF AIRCRAFT BANK ANGLE Final Report, 31 Aug. 1990 - 31 Aug. 1991
Jay C. Neubauer, Don C. Teas, Kent K. Gillingham, and Peg Murphy Feb. 1992 31 p
(Contract F33615-89-C-0603)
(AD-A247825; AL-TR-1991-0121) Avail: NTIS HC/MF A03

This report describes a study which examined flight performance of instrument rated pilots using only an auditory bank angle display with outside in and inside out display reference modes. Spatial orientation is based on the evaluation of data from visual, vestibular, and other sensory mechanisms which provide information about motion and position relative to a stationary reference derived from walking upright on hard ground. Auditory and visual events are located by an observer within the orientational space. In an aircraft, the reference is no longer stationary and the evaluation of data from orientation mechanisms may be in error. These errors can lead to responses which, although intended to be corrective, actually are not. Visual information, for example, may be processed foveally, for recognition and identification of elements, or extrafoveally, for orientation in space. The two visual modes, recognition and guidance, can present conflicting, confusing orientation cues in aircraft. False horizons perceived while flying over water at night or over a sloping cloud bank are errors attributable to the guidance mode. Pilots sometimes accept these false cues as veridical and are unaware of the error until the true relation is recognized, perhaps too late. GRA

N92-27964# RDP, Inc., Waltham, MA.
VISUAL PHOTOMETRIC EXPERIMENT DATA PROCESSING SYSTEM Final Report, 23 Jan. 1987 - 31 Dec. 1991
Kevin P. Larson and Andrew J. Mazzella, Jr. 31 Dec. 1991 56 p
(Contract F19628-87-C-0065)
(AD-A248657; PL-TR-91-2248; SBI-AD-E200944) Avail: NTIS HC/MF A04

Data processing and analysis developments for the Visual Photometric Experiment (VIPER) are described in detail, including descriptions of data files and program execution. GRA

N92-28079# New Brunswick Univ., Fredericton.
DREDGING RESEARCH PROGRAM: GLOBAL POSITIONING SYSTEM BIBLIOGRAPHY Final Report
Wendlynn Wells, David E. Wells, and Alfred Kleusberg Mar. 1992 69 p
(Contract DAAL03-86-D-0001)
(AD-A248954; WES/TR/D-92-2) Avail: NTIS HC/MF A04

This bibliography was prepared to supplement Technical Report DRP-92-1, Kinematic Differential Global Positioning System. The bibliography represents a current (as of March 1989) and comprehensive listing of publications and papers dealing with the Global Positioning System. GRA

N92-28132# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
A FORMAL DEFINITION OF THE OBJECT-ORIENTED PARADIGM FOR REQUIREMENTS ANALYSIS M.S. Thesis
Andrew D. Boyd Dec. 1991 90 p
(AD-A246814; AFIT/GSS/ENG/91D-3) Avail: NTIS HC/MF A05

This paper develops a formal definition of the Object Oriented paradigm for requirements analysis. The literature was surveyed for both formal and informal methods for conducting an Object-Oriented Requirements Analysis (OORA). None of the methods were found to be adequate for doing an OORA. A formal definition of an OORA, based on the concept of classes, is developed. The definition itself is presented as set and relation theory. A supporting graphical representation is also developed and presented. The graphical method allows a system to be successfully leveled. The formalism is validated by applying it to the Air Traffic Control (ATC) simulation. GRA

N92-28133# Naval Postgraduate School, Monterey, CA. Dept. of Oceanography.
EVALUATION OF ABSOLUTE POSITIONING USING THE DEFENSE MAPPING AGENCY'S (GASP) PROGRAM M.S. Thesis
Dennis Bredthauer Sep. 1991 161 p
(AD-A246818; NPS-OC-91-006) Avail: NTIS HC/MF A08

The Geodetic Absolute Sequential Positioning (GASP) program, as utilized by the Defense Mapping Agency (DMA), processes static GPS measurements collected with the TI 4100 GPS receiver to estimate geodetic point (absolute) positions. In this thesis, the GASP program is modified to accept data from different receiver types, the estimated point positions are compared to positions produced by the Transit Doppler positioning system, the between-receiver estimates are compared, the difference between estimates using the broadcast and the precise are examined, and the effects of Selective Availability assessed. During the Monterey Bay Precision Positioning Experiment (MBPPE), conducted in the Winter of 1990-1991, a large set of static GPS positioning data was collected with four types of GPS receiver: the TI 4100, the Trimble 4000ST, the Ashtech LD XII, and the Magnavox MX4200. Additional static GPS measurements were obtained with the TI 4100 receiver at a reference site established to support the experiment. A third data set was collected after activation of Selective Availability. Measurements collected with the TI 4100, Trimble, and Ashtech receivers were subsequently processed with GASP using broadcast and precise ephemerides to produce point position estimates. In order for GASP to accept the data from the Ashtech and Trimble receivers, the program had to be modified. GRA

N92-27894*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
STATUS OF AUTOMATIC GUIDANCE SYSTEMS FOR ROTORCRAFT IN LOW ALTITUDE FLIGHT
Banavar Sridhar, Victor H. L. Cheng, and Harry N. Swenson *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 12 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27895# Universitaet der Bundeswehr Muenchen, Neubiberg (Germany, F.R.). Inst. fuer Systemdynamik und Flugmechanik.
KNOWLEDGE-BASED PLANNING FOR CONTROLLED AIRSPACE FLIGHT OPERATION AS PART OF A COCKPIT ASSISTANT
T. Prevot, R. Onken, and H.-L. Dudek (Dornier System G.m.b.H., Friedrichshafen, Germany, F.R.) *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 8 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27896# Naval Air Development Center, Warminster, PA.
COMPARISON OF THE EVENT-STEP ALGORITHM TO OTHER PATH PLANNING METHODS TO AVOID DYNAMIC 3D OBSTACLES
Mark Silbert *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 9 p Revised (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27897# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany, F.R.). Inst. of Flight Guidance.
ON BOARD PLANNING OF 4D-TRAJECTORIES
V. Adam and R. Kohrs *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 12 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27898# Honeywell, Inc., Minneapolis, MN. Systems and Research Center.
TRAJECTORY OPTIMIZATION FOR HYPERSONIC AIRCRAFT GUIDANCE
R. L. Schultz, M. J. Hoffman, A. M. Case, and S. I. Sheikh *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 16 p Sponsored by AFWAL (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27900# Mitre Corp., Bedford, MA.
SEARCH ROUTE PLANNING
J. R. VanZandt *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 14 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27901# Electronic System G.m.b.H., Munich (Germany, F.R.).
AN EFFICIENT METHOD FOR THREE-DIMENSIONAL ROUTE PLANNING WITH DIFFERENT STRATEGIES AND CONSTRAINTS
U. Leuthaeusser and F. Raupp *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 5 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27904# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
PARALLEL KNOWLEDGE BASED SYSTEMS ARCHITECTURES FOR IN-FLIGHT MISSION MANAGEMENT
M. R. Bowyer and S. A. Cross *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 12 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27905# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (Germany, F.R.). Inst. of Flight Guidance.
IMPLEMENTATION AND OPERATIONAL EXPERIENCE WITH A NEW ARRIVAL TRAFFIC MANAGEMENT SYSTEM AT THE FRANKFURT ATC-CENTER
M. Schubert and U. Voelckers *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 17 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.For land transportation vehicles see *85 Urban Technology and Transportation*.

N92-27335# Naval Postgraduate School, Monterey, CA.
A WIND TUNNEL STUDY OF THE PIONEER REMOTELY PILOTED VEHICLE M.S. Thesis
Robert M. Bray Jun. 1991 144 p
(AD-A247028) Avail: NTIS HC/MF A07

Remotely Piloted Vehicles (RPVs) performed impressively well in the recent Gulf War. The Pioneer RPV has been fielded as the ground launched, short-range RPV for the Marine Corps and as a RATO-launched, short-range RPV operating off of the Navy's battleships. A realistic flight simulation of the Pioneer RPV for training system operators was desired. A 0.4 scale model of the Pioneer RPV was tested in the Wichita State University 7 by 10 foot wind tunnel to acquire its aerodynamic coefficients. A collateral benefit was the calculation of the Pioneer RPV's flight performance. Graphs and tables of the stability and control derivatives necessary for a 'six degree of freedom' simulation are included in this thesis. Additionally, performance predictions were calculated using these newly acquired aerodynamic data and engine test data from the Naval Air Propulsion Center. Preliminary comparisons indicate good correlation between the wind tunnel based performance predictions and actual flight data. GRA

N92-27429# National Aerospace Lab., Tokyo (Japan). Flight Research Div.
NAL DORNIER 228-200 FLIGHT RESEARCH AIRPLANE: PRESENT STATUS AND OUTLINE OF THE INSTALLED EQUIPMENT
Takatsugu Ono Jul. 1991 56 p In JAPANESE; ENGLISH summary Original contains color illustrations
(NAL-TM-637; ISSN-0452-2982; JTN-92-80375) Avail: NTIS HC/MF A04

An outline is presented concerning the present status of the Dornier 228-200, a NAL flight research airplane introduced in 1988. A description is given of the plane's introduction process, modifications, currently installed equipment and ground support system, and typical flight data. Technical information is provided which will be useful for planning various kinds of future flight experiments. Author (NASDA)

N92-27719# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
AN ANALYSIS OF FIXED WING TACTICAL AIRLIFTER CHARACTERISTICS USING AN INTRA-THEATER AIRLIFT COMPUTER MODEL M.S. Thesis
Paul Pappas Sep. 1991 186 p
(AD-A246908; AFIT/GLM/ENS/91S-50) Avail: NTIS HC/MF A09

This study used computer simulation to identify which tactical airlifter characteristics most significantly affected tactical airlift capability in a given scenario. The Generalized Air Mobility model was used to simulate a tactical airlift system. Aircraft characteristics within the model were grouped into six variables. A 2(exp 6) two

level full factorial experimental design was used to assess the effect of changes in aircraft characteristics on the effectiveness of the tactical airlift system. The Yates algorithm was used to identify significant terms based upon the results of the factorial experiment. These significant terms were used to develop a parsimonious regression model that represented the response function of the experimental variables. The variables remaining in the regression model represented the tactical airlifter characteristics that most significantly affected the capability of the tactical airlift system. Only one scenario was used in the experiment: Central America. This scenario was characterized by a tropical mountainous environment, poor infrastructure, a limited number of major airfields, and many short unprepared airfields. Two groups of tactical airlifter characteristics were found to significantly affect capability of the tactical airlift system in this scenario: The size of the aircraft's cargo bay, and the aircraft's ability to operate on unprepared surfaces. GRA

N92-27870# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Flight Mechanics Panel.

TECHNICAL EVALUATION REPORT ON THE FLIGHT MECHANICS PANEL SYMPOSIUM ON FLYING QUALITIES

Harold Andrews (Aviation Systems and Research, Arlington, VA.) Apr. 1992 22 p

(AGARD-AR-311; ISBN-92-835-0665-0) Copyright Avail: NTIS HC/MF A03; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The validity of constraining the responses of today's control dominant aircraft to conform to the classic flying qualities criteria derived from stability dominant aircraft experience has been an issue for many years. The introduction of full time visual scene enhancement with sensor fusion, and computer generated/interpreted night scenes, and the use of intergrated flight and propulsion control schemes and direct force controllers have expanded flight envelopes, reduced drag, increased maneuverability, provided the framework for practical gust alleviation and active flutter suppression, and provided flexibility for fault-tolerant, damage-adaptive flight controls. However, the updating of flying qualities criteria has in general not kept pace with these technological changes. The Flight Mechanics Panel of AGARD therefore decided to organize a Symposium to review flying qualities issues today, and to report progress towards their resolution. The topic areas included: Flying Qualities Experiences on Contemporary Aircraft; Application of Flying Qualities Specifications; Flying Qualities Research and Flying Qualities at High Incidence. This Technical Evaluation Report evaluates the presentations and discussions in each Session, draws relevant conclusions and makes recommendations for future activities in this area. The papers presented at this Symposium are published as AGARD Conference Proceedings 508. Author

N92-27982# General Dynamics Corp., Fort Worth, TX.

ADVANCED TACTICAL AIRCRAFT EARLY RISK REDUCTION PHASE 1 BROAD BAND IR WINDOW STUDY Final Report

Daniel T. Hislop 12 Sep. 1991 171 p

(Contract N00019-88-C-0051)

(AD-A246633; Rept-86PR1314) Avail: NTIS HC/MF A08

This report summarizes the data collected in a study of broad band IR window material candidates for high performance, low observable aircraft. Laser target designators for these new aircraft will require a common window for the laser (1.06 and 1.54 microns) and the target tracking FLIR (8 to 12 microns). This report summarizes the GD portion of a joint GD/McDonnell Aircraft Company effort. GRA

N92-28002 Department of the Navy, Washington, DC.

DUAL MODULAR ROCKET LAUNCHER Patent

Lanny D. Drummond, inventor (to Navy) and Joseph E. Williams, II, inventor (to Navy) 22 Oct. 1991 8 p Filed 15 Oct. 1990

(AD-D015228; US-Patent-5,058,481; US-Patent-Appl-SN-597134; US-Patent-Class-89-1.816) Avail: US Patent and Trademark Office

A rocket launcher is discussed. The launcher is made up of a pair of modules fabricated from a lightweight composite material. Each module is comprised of twelve integrally formed lightweight composite tubes. The tubes are located relative to each other within the modules so that the axes are generally parallel. Each module is aerodynamically configured such that the modules may be fastened together to form a rocket launcher which when attached to an aircraft is capable of launching twenty-four rockets. The rocket launcher of this invention may also be used to launch only twelve rockets by attaching only one module to the aircraft. GRA

N92-28118# Aeronautical Research Labs., Melbourne (Australia).

A PRELIMINARY STUDY ON DAMAGE DETECTION USING PIEZOELECTRIC FILM

J. Bennett, J. Paul, R. Jones, and A. Goldman Nov. 1991 29 p

(AD-A246350; ARL-Struc-TM-538; DODA-AR-006-620) Avail: NTIS HC/MF A03

Damage detection in metallic and composite structural components is of particular importance in the damage tolerant assessment and the maintenance of aircraft structures. This report describes the use of piezoelectric film for sensing damage in a number of structural components. Three specimens were evaluated, viz.: (1) a rivetted lap joint; (2) a surface crack in an aluminum alloy; (3) an impact damaged composite laminate. The lap joint was chosen to be representative of a fuselage lap joint in modern, wide bodied aircraft. The joint contained multi-site damage repaired with a bonded doubler. Piezoelectric film was applied to the doubler and the underlying damage was detected. The second specimen was a conventional aluminum alloy with surface flaws emanating from a fastener hole. The last specimen was a graphite epoxy composite laminate with impact damage at two locations, i.e., multiple damages sites. GRA

N92-28123# Naval Postgraduate School, Monterey, CA.

FLIGHT TESTING OF A HALF-SCALE REMOTELY PILOTED VEHICLE M.S. Thesis

Paul A. Koch Mar. 1992 62 p

(AD-A248568) Avail: NTIS HC/MF A04

Flight testing of a half-scale Pioneer remotely piloted vehicle was conducted to determine the longitudinal static stability flying qualities. A pulsewidth modulated telemetry system was used to provide data on control surface deflections, angle of attack, sideslip angle, and airspeed. From the testing, the neutral point was determined to be 41.2 percent of mean aerodynamic chord, which was within 13 percent of theoretical predictions. On a subsequent flight, the Pioneer experienced electromagnetic interference which caused the disruption of the flight control uplink signal, causing it to fly uncontrolled into the ground. Simultaneous playback of video and time histories of downlink data was instructional in analyzing the interference leading to the accident. GRA

N92-28153# National Aerospace Lab., Tokyo (Japan). Flight Test Team.

EVALUATION OF HIGH LIFT DEVICES OF THE QUIET STOL EXPERIMENTAL AIRCRAFT ASKA

Toshio Bandou Apr. 1991 33 p In JAPANESE; ENGLISH summary

(NAL-TR-1102; ISSN-0389-4010; JTN-92-80379) Avail: NTIS HC/MF A03

The powered high lift device of the ASKA, the NAL Short Take Off and Landing (STOL) experimental aircraft, is an Upper Surface Blowing (USB) device that forces the jet exhaust flow downward, thus producing higher lift due to the Coanda effect. Three pieces of equipment were incorporated that enhanced the USB high lift generation: Boundary Layer Control (BLC), drooped ailerons, and vortex generations. The aerodynamic effects of these equipment are described based on flight test data. In early flight test stages, a shallow ASKA USB flap configuration encountered buffeting, beginning at a lower angle of attack than expected, thereby limiting the flight envelope. Based on the wind tunnel test

surveys, a nacelle fence and drooped leading edge were subsequently installed to delay the buffet onset. The effect of these devices is also discussed based on flight test results.
Author (NASDA)

N92-28191# National Aerospace Lab., Tokyo (Japan). Flight Test Team.
EVALUATION OF LANDING CONFIGURATION BY FLIGHT TEST OF THE QUIET STOL EXPERIMENTAL AIRCRAFT ASKA
Toshio Bandou May 1991 58 p In JAPANESE; ENGLISH summary
(NAL-TR-1113; ISSN-0389-4010; JTN-92-80382) Avail: NTIS HC/MF A04

During the design phase of NAL Short Take Off and Landing (STOL) experimental aircraft, ASKA, the landing configuration was determined to be a 40 degree Upper Surface Blowing (USB) flap angle and a 65 degree outboard flap angle, whereas the design phase go around configuration was specified as a 20 degree USB flap angle, a 65 degree outboard flap angle, and leading edge Boundary Layer Control (BLC) off. Based on the results of alpha sweep tests and landing evaluations, it was determined that the design landing configuration had a small alpha-margin and high pitch attitude which produced poor downward viewing during approach and landing. The alpha-margin of the design go around configuration was also respectively small. Subsequently, flight tests were conducted to determine new configurations for landing and go around, and using these test results, a 60 degree USB flap angle was selected for the landing configuration and a 30 degree USB flap angle was for the go around one. A 65 degree outboard flap angle with all BLC on was also decided for both configurations. The process of determining these final configurations using flight tests and evaluations is discussed. Author (NASDA)

N92-27890# Alenia, Torino (Italy). Div. Avionica ed Apparati Speciali.
AUTOMATED TARGET TRACKING AND LOCATION TECHNIQUES APPLIED TO OPTICAL PAYLOADS ON REMOTELY PILOTED VEHICLES
Mario Audenino, Antonio Gaglio, and Paolo Faggion *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 14 p
(For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N92-27424*# Massachusetts Inst. of Tech., Cambridge. Aeronautical Systems Lab.
EXPERIMENTAL EVALUATION OF CANDIDATE GRAPHICAL MICROBURST ALERT DISPLAYS Interim Annual Report
Craig R. Wanke and R. John Hansman Jun. 1992 29 p Previously announced in IAA as A92-25745
(Contract NASA Order L-91172-C; F19628-90-C-0002; RTOP 505-64-12-01)
(NASA-CR-189633; NAS 1.26:189633; ASL-91-2) Avail: NTIS HC/MF A03

A piloted flight simulator experiment was conducted to evaluate issues related to the display of microburst alerts on electronic cockpit instrumentation. Issues addressed include display clarity, usefulness of multilevel microburst intensity information, and whether information from multiple sensors should be presented separately or 'fused' into combined alerts. Nine active airline pilots of 'glass cockpit' aircraft participated in the study. Microburst alerts presented on a moving map display were found to be visually clear and useful to pilots. Also, multilevel intensity information coded by colors or patterns was found to be important for decision making purposes. Pilot opinion was mixed on whether to 'fuse' data from multiple sensors, and some resulting design tradeoffs were identified. The positional information included in the graphical alert presentation was found useful by the pilots for planning lateral missed approach maneuvers, but may result in deviations which could interfere with normal airport operations. A number of flight crew training issues were also identified. Author

N92-27925# General Dynamics Corp., Fort Worth, TX.
CORE AVIONICS AND STANDARDIZATION Final Report, 23 Sep. 1991 - 31 Mar. 1992
David L. Kellog, J. K. Henderson, Mike J. Harris, and Anthony J. Schiavone 31 Mar. 1992 47 p
(Contract N00014-91-C-0233)
(AD-A248326) Avail: NTIS HC/MF A03

The standardization of avionics is based on modularity and commonality across an instruction set architecture. When budgetary cutbacks are considered, the ability to use standardization to cut costs assumes greater importance. Methodology to examine benefits of standardization is presented. Objectives associated with standards adopted by the Joint Integrated Avionics Working Group (JIAWG) and the Next Generation Computer Resources (NGCR) program are examined. Comparisons and recommendations are made. GRA

N92-27973# Computer Resource Management, Inc., Pleasantville, NJ.
AVIONIC DATA BUS INTEGRATION TECHNOLOGY Final Report
D. Elwell, L. Harrison, J. Hensyl, and N. VanSuetendael Dec. 1991 233 p
(Contract DTFA03-86-C-00042)
(DOT/FAA/CT-91/19) Avail: NTIS HC/MF A11

As multiple digital avionic systems were introduced into aircraft, there arose a need for digital communications between systems. In the early 1970s, many different digital data bus designs were used to provide this communication. Because these digital systems proved to be reliable and cost effective, their popularity increased. Proliferation led to standardization, particularly in the air transport category of aircraft, which allowed communications between line replaceable units (LRUs) to become more complex. The LRUs began to rely more heavily on each other to reduce the amount of equipment required. Sensor data and systems data could be shared among multiple systems, rather than each system requiring its own private source. Integrated digital avionics are increasingly being used to implement essential and critical functions that cannot be sufficiently reproduced by conventional means. The safety of such aircraft is highly dependent upon the computer software, hardware, and data buses connecting the systems. The newest concerns relate to the problems that are unique to highly integrated systems. There is no standard with which to assess the possible impact of these bus-based systems on aircraft safety. These and other advanced avionic systems will result in specific safety assessment problems when the appropriate data packages are submitted to the Federal Aviation Administration during the certification process. Author

N92-28004# Amptek, Inc., Bedford, MA.
PROTOTYPE INSTRUMENTATION AND DESIGN STUDIES
Alan C. Huber, A. W. Everest, John O. McGarity, David J. Sperry, and Ernest G. Holeman 24 Sep. 1991 34 p
(Contract F19628-87-C-0094)
(AD-A248378; PL-TR-91-2236; AD-E200941; SR-3) Avail: NTIS HC/MF A03

Flight prototype sensor systems using spherical sections and electrostatic deflection have been developed, fabricated, tested, and calibrated. The detectors measure the flux of ions and electrons over a 100 x 10 deg angular fan and in 32 discrete energy levels from 10 eV to 10 KeV. This study describes the sensor system design for an instrument package for shuttle flight as well as a correlator to look for wave-particle interactions. Operating procedures for a 2.4 Gigabyte Flight Data Recorder are included. GRA

N92-27906# McDonnell Aircraft Co., Saint Louis, MO.
ICAAS PILOTED SIMULATION EVALUATION
R. P. Meyer, R. J. Landy, and D. J. Halski *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 16 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-28093# Litton Industries, Blacksburg, VA. Poly-Scientific Div.
FIBER OPTIC DATA BUSSES FOR AIRCRAFT
Norris E. Lewis *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 15 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxilliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N92-27206# Naval Postgraduate School, Monterey, CA.
AN INVESTIGATION INTO THE PERFORMANCE CHARACTERISTICS OF A SOLID FUEL SCRAMJET PROPULSION DEVICE M.S. Thesis
William J. Angus Dec. 1991 59 p
(AD-A246486) Avail: NTIS HC/MF A04

An investigation was conducted to evaluate the performance qualities of a supersonic ramjet propulsion device (SCRAMJET) using a solid fuel. The fuel grains were fabricated from Plexiglas and were cylindrical, with an axisymmetric, circular perforation that diverged in the downstream direction. A small amount of hydrogen gas was required in an initial recirculation zone in order to sustain combustion. With Combustor inlet conditions of 150 psia, 1000 R, and a Mach number of 1.5, a combustor exit Mach number of approx. 1.4 was maintained. Due to poor mixing conditions, the combustion efficiency of the solid fuel was only 57 pct. GRA

N92-27379*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.
INTEGRATED FLIGHT PROPULSION CONTROL RESEARCH RESULTS USING THE NASA F-15 HIDEC FLIGHT RESEARCH FACILITY
James F. Stewart Jun. 1992 22 p Proposed for presentation at the 6th Biannual Flight Test Conference, Hilton Head, SC, 24-26 Aug. 1992
(RTOP 533-02-36)
(NASA-TM-4394; H-1817; NAS 1.15:4394; AIAA-Paper-92-4106)
Copyright Avail: NTIS HC/MF A03

Over the last two decades, NASA has conducted several flight research experiments in integrated flight propulsion control. Benefits have included increased thrust, range, and survivability; reduced fuel consumption; and reduced maintenance. These flight programs were flown at NASA Dryden Flight Research Facility. This paper presents the basic concepts for control integration, examples of implementation, and benefits of integrated flight propulsion control systems. The F-15 research involved integration of the engine, flight, and inlet control systems. Further extension of the integration included real time, onboard optimization of engine, inlet, and flight control variables; a self repairing flight control system; and an engines only control concept for emergency control. The flight research programs and the resulting benefits are described for the F-15 research. Author

N92-27422# Rolls-Royce Ltd., Bristol (England).
THERMALLY SPRAYED COATING SYSTEMS FOR SURFACE PROTECTION AND CLEARANCE CONTROL APPLICATIONS IN AERO ENGINES
T. N. Rhys-Jones 1 Apr. 1990 15 p Repr. from Surface and Coatings Technology, v. 43/44, 1990 p 402-415
(PNR-90802; ETN-92-90845) Copyright Avail: NTIS HC/MF A03

The principal current and new thermal spray coating processes used for compressor, combustion chamber and turbine applications in aircraft engines are described with particular reference to high velocity combustion and plasma spraying techniques. The uses of coatings for wear and erosion resistance, oxidation and corrosion control, thermal barrier applications and gas path sealing (clearance) are discussed. ESA

N92-27519*# Iowa State Univ. of Science and Technology, Ames. Dept. of Mechanical Engineering.
VISUALIZATION OF BOUNDARY-LAYER DEVELOPMENT ON TURBOMACHINE BLADES WITH LIQUID CRYSTALS Final Technical Report
Dale E. VanZante and Theodore H. Okiishi Dec. 1991 65 p Original contains color illustrations
(Grant NAG3-917; ERI Proj. 3067)
(NASA-CR-190433; NAS 1.26:190433; ISU-ERI-Ames-92114; TCRL-36) Avail: NTIS HC/MF A04; 16 functional color pages

This report documents a study of the use of liquid crystals to visualize boundary layer development on a turbomachine blade. A turbine blade model in a linear cascade of blades was used for the tests involved. Details of the boundary layer development on the suction surface of the turbine blade model were known from previous research. Temperature sensitive and shear sensitive liquid crystals were tried as visual agents. The temperature sensitive crystals were very effective in their ability to display the location of boundary layer flow separation and reattachment. Visualization of natural transition from laminar to turbulent boundary layer flow with the temperature sensitive crystals was possible but subtle. The visualization of separated flow reattachment with the shear sensitive crystals was easily accomplished when the crystals were allowed to make a transition from the focal-conic to a Grandjean texture. Visualization of flow reattachment based on the selective reflection properties of shear sensitive crystals was achieved only marginally because of the larger surface shear stress and shear stress gradient levels required for more dramatic color differences. Author

N92-27587*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.
FLIGHT-DETERMINED BENEFITS OF INTEGRATED FLIGHT-PROPULSION CONTROL SYSTEMS
James F. Stewart, Frank W. Burcham, Jr., and Donald H. Gatlin Jun. 1992 25 p Proposed for presentation at the 18th ICAS Congress, Beijing, China, 20-25 Sep. 1992
(RTOP 533-02-36)
(NASA-TM-4393; H-1811; NAS 1.15:4393; Paper-92-2.9.1) Avail: NTIS HC/MF A03

Over the last two decades, NASA has conducted several experiments in integrated flight-propulsion control. Benefits have included improved maneuverability; increased thrust, range, and survivability; reduced fuel consumption; and reduced maintenance. This paper presents the basic concepts for control integration, examples of implementation, and benefits. The F-111E experiment integrated the engine and inlet control systems. The YF-12C incorporated an integral control system involving the inlet, autopilot, autothrottle, airdata, navigation, and stability augmentation systems. The F-15 research involved integration of the engine, flight, and inlet control systems. Further extension of the integration included real-time, onboard optimization of engine, inlet, and flight control variables; a self-repairing flight control system; and an engines-only control concept for emergency control. The F-18A aircraft incorporated thrust vectoring integrated with the flight control system to provide enhanced maneuvering at high angles of attack.

The flight research programs and the resulting benefits of each program are described. Author

N92-27652*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
EXPERIMENTAL STUDY OF CROSS-STREAM MIXING IN A RECTANGULAR DUCT
D. S. Liscinsky, B. True, A. Vranos (AB Research Associates, South Windsor, CT.), and J. D. Holdeman 1992 13 p Proposed for presentation at the 28th Joint Propulsion Conference and Exhibit, Nashville, TN, 6-8 Jul. 1992; sponsored by AIAA, SAE, ASME, and ASEE Original contains color illustrations
(RTOP 537-02-20)
(NASA-TM-105694; E-7082; NAS 1.15:105694; AIAA-92-3090)
Copyright Avail: NTIS HC/MF A03; 4 functional color pages

An experimental investigation of non-reacting cross-stream jet injection and mixing in a rectangular duct was conducted for application in a low emissions combustor. Planar digital imaging was used to measure concentration distributions in planes perpendicular to the duct axis. Mixing rate was measured for 45 deg slanted slot and round orifice injectors. Five areas of inquiry are discussed: (1) mixing improves continuously with increasing momentum-flux ratio; (2) given a momentum-flux ratio, there is an optimum, orifice spacing; (3) mixing is more dependent on injector geometry than mass flow ratio; (4) mixing is influenced by relative slot orientation; and (5) jet structure is different for round holes and slanted slots injectors. The utility of acquiring multipoint fluctuating properties of the flow field is also demonstrated. Author

N92-27669*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
EXPERIMENTAL PERFORMANCE OF THREE DESIGN FACTORS FOR VENTRAL NOZZLES FOR SSTOVL AIRCRAFT
Barbara S. Esker and Gail P. Perusek Jul. 1992 16 p Presented at the 28th Joint Propulsion Conference and Exhibit; sponsored by AIAA, SAE, ASME, and ASEE
(RTOP 505-68-32)
(NASA-TM-105697; E-7085; NAS 1.15:105697; AIAA-92-3789)
Avail: NTIS HC/MF A03

An experimental study of three variations of a ventral nozzle system for supersonic short-takeoff and vertical-landing (SSTOVL) aircraft was performed at the NASA LeRC Powered Lift Facility. These test results include the effects of an annular duct flow into the ventral duct, a blocked tailpipe, and a short ventral duct length. An analytical study was also performed on the short ventral duct configuration using the PARC3D computational dynamics code. Data presented include pressure losses, thrust and flow performance, internal flow visualization, and pressure distributions at the exit plane of the ventral nozzle. Author

N92-27817# Massachusetts Inst. of Tech., Cambridge.
SELF-ADAPTIVE AEROPROPULSION COMPONENTS-ENHANCING AXIAL COMPRESSOR PERFORMANCE Annual Letter Report, FY 1991
A. H. Epstein 1992 3 p
(Contracts N00014-87-K-0352; N00014-91-J-1575)
(AD-A246123) Avail: NTIS HC/MF A01

The principal technical objective of this work is to explore the use of active feedback stabilization to suppress the performance limiting instabilities endemic to jet engine compression systems known as rotating stall and surge. Previous work under ONR sponsorship has shown that these disturbances are the mature form of small amplitude travelling waves characteristic of turbomachinery, and that damping of the small amplitude waves prevents rotating stall. A major theoretical conclusion of this work, backed by experimental data, is that the compressor acts as a fluid oscillator with the rotating stall regimes representing the eigenmodes of the system. Thus, it is important to understand both the details of the oscillator (the compressor) and its forcing functions (distortion and turbulent fluctuations). Almost nothing is currently known about the nature of turbulent fluctuations in a jet engine and their relationship to compressor stability since, prior to the concept of active compressor stabilization, there was little motivation to pursue these questions. The work to date has been on low speed research compressors with uniform inflow and low turbulence levels. The main aim of the new work is to extend both theory and experiment to include wave detection and active compressor control in the presence of inlet distortion and high turbulence levels characteristic of actual aircraft installations. GRA

N92-28073# Cranfield Inst. of Tech., Bedford (England). Dept. of Turbomachinery and Engineering Mechanics.
RADIAL INFLOW TURBINE STUDY Interim Report No. 6, 1 Jun. - 31 Dec. 1991
S. Hami and R. L. Elder Dec. 1991 12 p
(Contract DAJA45-89-C-0006)
(AD-A246938; R/D-5824-AN-01) Avail: NTIS HC/MF A03

The radial inflow turbine is a primary component used both in small gas turbines and turbochargers. Better understanding of the flow processes occurring within the small passages of the machine could result in the improved design of units. As most of the detailed aerodynamics is still ill-defined, a joint research project with the objective of improving our understanding was carried out. This document gives the sixth report on the project. It describes progress and measurements taken downstream of the rotor. GRA

N92-28076# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
AFRAPT PROGRAM AT TEXAS A AND M UNIVERSITY RESEARCH FOR ADVANCED AIRCRAFT ENGINE STRUCTURES Final Report, Sep. 1986 - Aug. 1991
John M. Vance 23 Oct. 1991 9 p
(Grant AF-AFOSR-0297-86)
(AD-A247040; AFOSR-92-0163TR) Avail: NTIS HC/MF A02

Sixteen graduate students in mechanical and aerospace engineering were supported on this grant, producing four M.S. graduates and three Ph.D. graduates during the grant period. Eight students are still pursuing research and studies toward their degree. Two students failed the Ph.D. qualifying examination and left Texas A and M. Six of the program participants are now employed by companies in the aircraft or aerospace propulsion field. GRA

N92-28162# Naval Postgraduate School, Monterey, CA.
AN APPRAISAL OF COST-EFFECTIVENESS MODELS USED IN THE AIR FORCE AND NAVY AIRCRAFT ENGINE COMPONENT IMPROVEMENT PROGRAMS M.S. Thesis
James D. Davis Dec. 1991 94 p
(AD-A245910) Avail: NTIS HC/MF A05

This thesis examines the cost-effectiveness models used by the Air Force and Navy to assist with the decision-making process of their Component Improvement Programs (CIP). The focus is on the elements of the two models and the reasonableness of each model's results. A sensitivity analysis was performed on significant input parameters to determine what effect errors in these parameters would have on the predicted return-on-investment (ROI) results. The author concluded that, although the models provide insight into life cycle costs (LCC) of aircraft engines, they are extremely sensitive to errors in certain input variables and should not be relied upon for CIP budget justification. GRA

N92-27461# Textron Lycoming, Stratford, CT.
APPLICATION OF CFD IN THE DESIGN OF GAS TURBINE ENGINE COMPONENTS
Arun K. Sehra, Mohamed A. Abolfadl, and Mohamed G. Zedan *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 26 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27462# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
VALIDATION OF A CANARI CODE BY THE COMPUTATION OF THREE DIMENSIONAL TURBULENT FLOW IN TURBINE VALVE [VALIDATION DU CODE CANARI PAR LE CALCUL DE L'ECOULEMENT TRIDIMENSIONNEL TURBULENT DANS UN DISTRIBUTEUR DE TURBINE]
Beatrice Escande and Laurent Cambier *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 8 p In FRENCH; ENGLISH summary (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27463# Motoren- und Turbinen-Union Muenchen G.m.b.H. (Germany, F.R.).
COMPUTATION AND VISUALIZATION OF SPECIFIC FLOW PHENOMENA IN TURBOMACHINERY APPLICATION
J. Haarmeyer and B. Stubert *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 8 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27464# Vrije Univ., Brussels (Belgium). Computational Fluid Dynamics Group.
AN INTEGRATED CFD SYSTEM FOR 3D TURBOMACHINERY APPLICATIONS
C. Hirsch, C. Lacor, C. Dener, and D. Vucinic *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 15 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27466# Royal Aerospace Establishment, Farnborough (England).
PREDICTIONS AND MEASUREMENTS OF 3D VISCOUS FLOW IN A TRANSONIC TURBINE NOZZLE GUIDE VANE ROW
G. C. Horton, S. P. Harasgama, and K. S. Chana *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 16 p Previously announced as N92-14319 (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27469# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
STEADY AND UNSTEADY 3D FLOW COMPUTATION THROUGH A TRANSONIC TURBINE STAGE [CALCULS 3D STATIONNAIRE ET INSTATIONNAIRE DANS UN ETAGE DE TURBINE TRANSSONIQUE]
Alain LeMeur *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 24 p In FRENCH; ENGLISH summary (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27484# Rolls-Royce Ltd., Bristol (England). Combustion Technology Dept.
MODELLING THE VAPORISER AND PRIMARY ZONE FLOWS FOR A MODERN GAS TURBINE COMBUSTION CHAMBER
N. R. Bond, J. M. LeVallois, and K. R. Menzies *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 18 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

For related information see also *05 Aircraft Design, Testing and Performance.*

N92-27200# Naval Postgraduate School, Monterey, CA.
DEVELOPMENT OF AN ACTIVE DAMPING SYSTEM TO AID IN THE ATTITUDE CONTROL OF FLEXIBLE SPACECRAFT M.S. Thesis
Evan S. Jones Dec. 1991 73 p
(AD-A246248) Avail: NTIS HC/MF A04

This thesis details the further refinement of the Naval Postgraduate School's Flexible Spacecraft Simulator and the first successful experimental control of the flexible system. The major emphasis of this work has been the development of a system to provide active damping to aid in control of the flexible modes of the system. The completed design of the circuit and the choice and placement of the piezoceramic sensors and actuators are presented. Verification of the computer model of the flexible system without active damping was completed and comparisons between the analytical and the experimental results are presented for simple proportional-derivative (PD) control using the main body angular position and rate. GRA

N92-27505# Naval Postgraduate School, Monterey, CA.
APPLICATION OF NEURAL NETWORK TO ADAPTIVE CONTROL THEORY FOR SUPER-AUGMENTED AIRCRAFT M.S. Thesis
Denis J. Bertrand Dec. 1991 205 p
(AD-A246596) Avail: NTIS HC/MF A10

The neural network structures developed in this thesis demonstrate the ability of parallel distributed processing in solving adaptive control problems. Adaptive control theory implies a combination of a control method and a model estimation. The control method investigated is the Lyapunov Model Reference Adaptive Control (MRAC) and the model estimation investigated is the linear least square estimator. The neural network theory is introduced with emphasis on the back-propagation algorithm. The implementation of the neural network adaptive control structure is demonstrated on the longitudinal dynamics of the X-29 fighter aircraft. Three configurations are proposed to train the neural network adaptive control structures to provide the appropriate inputs to the unstable X-29 plant so that desired responses can be obtained. These configurations are presented in eight cases, which emulate stable systems like the X-29 closed-loop plant or the optimal and the limited X-29 controllers, and unstable systems like the X-29 plant or its inverse. GRA

N92-27577# Wright Lab., Wright-Patterson AFB, OH.
ADD-ON DAMPING TREATMENT FOR LIFE EXTENSION OF THE F-15 UPPER-OUTER WING SKIN Final Report, Jan. 1989 - Feb. 1991
Vincent Levraea, Lynn Rogers, Arnel Pacia, and Michael Parin 30 Sep. 1991 122 p
(AD-A246149; WL-TM-91-307-FIBG) Avail: NTIS HC/MF A06

The purpose of this investigation was to design, fabricate, and verify candidate add-on damping treatments for the F-15 upper-outer wing skin. The F-15 upper-outer wing skin has experienced high cycle fatigue cracks caused by flow separation on the upper wing surface. The separated flow results during high load factor maneuvers, and in turn induced large vibratory loads on the upper wing skin and associated substructure. The capability of the F-15 to sustain these maneuvers allows the excitation to occur for sufficiently long periods of time to result in damage. Damage accumulates due to the resonant vibration of local skin/stiffener modes. The cracks initiate at the fastener holes adjacent to the integrally machined 'T' stiffeners and tend to propagate parallel to the stiffeners. Two damping treatments resulted from the investigation and were recommended for f-15 fleet retrofit. One was an external constrained-layer treatment and

the other was an internal 'stand-off' treatment. Laboratory vibration, corrosion, and thermal aging tests were conducted as part of the development of the add-on damping treatments. Estimates of the life extension factors for the external and internal damping treatments were 5 and 34 respectively. GRA

N92-28154# National Aerospace Lab., Tokyo (Japan). Flight Test Team.
NOTE ON FLIGHT MEASURED CONTROL EFFECTIVENESS OF THE QUIET STOL EXPERIMENTAL AIRCRAFT ASKA
Toshio Bandou Apr. 1991 32 p In JAPANESE; ENGLISH summary
(NAL-TR-1103; ISSN-0389-4010; JTN-92-80380) Avail: NTIS HC/MF A03

An aircraft's control effectiveness can be evaluated in flight tests by applying an exactly known moment to the aircraft. In the NAL Short Take Off and Landing (STOL) aircraft (ASKA), a method was adopted during flight tests to measure control effectiveness of a variable incidence T-tailplane with elevators, ailerons, and spoilers. Known pitching moments were applied by using crew members loaded with ballasts to move from either a forward to rear position or vice versa, whereas known rolling moments were produced by asymmetric fuel loading. Longitudinal spoiler characteristics as a result of spoiler deflections, were investigated by performing alpha sweep tests with a spoiler up-rig. This easy flight test method was used in ASKA's flight tests to evaluate control effectiveness. The flight measured control effectiveness is subsequently compared with wind tunnel test results.
Author (NASDA)

N92-28209*# Draper (Charles Stark) Lab., Inc., Cambridge, MA.
ROBUST INTELLIGENT FLIGHT CONTROL FOR HYPERSONIC VEHICLES Ph.D. Thesis - Massachusetts Inst. of Technology
Gregory Errol Chamitoff 20 Feb. 1992 348 p
(Contract NAS9-18426)
(NASA-CR-185680; NAS 1.26:185680; CSDL-T-1106) Copyright Avail: NTIS HC/MF A15

Intelligent optimization methods are applied to the problem of real-time flight control for a class of airbreathing hypersonic vehicles (AHSV). The extreme flight conditions that will be encountered by single-stage-to-orbit vehicles, such as the National Aerospace Plane, present a tremendous challenge to the entire spectrum of aerospace technologies. Flight control for these vehicles is particularly difficult due to the combination of nonlinear dynamics, complex constraints, and parametric uncertainty. An approach that utilizes all available a priori and in-flight information to perform robust, real time, short-term trajectory planning is presented.
Author

N92-27956# National Aerospace Lab., Tokyo (Japan). Structural Mechanics Div.
NUMERICAL SIMULATION OF SHOCK-STALL FLUTTER OF AN AIRFOIL USING THE NAVIER-STOKES EQUATIONS
K. Isogai *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 12 p (For primary document see N92-27936 18-02)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27958# National Aerospace Lab., Amsterdam (Netherlands).
DEVELOPMENT OF A METHOD TO PREDICT TRANSONIC LIMIT CYCLE OSCILLATION CHARACTERISTICS OF FIGHTER AIRCRAFT
J. J. Meijer and A. M. Cunningham, Jr. (General Dynamics Corp., Fort Worth, TX.) *In* AGARD, Transonic Unsteady Aerodynamics and Aeroelasticity Mar. 1992 21 p Sponsored in part by AF and General Dynamics Corp. (For primary document see N92-27936 18-02)
(Contract NIVR-07801N)
Copyright Avail: NTIS HC/MF A17; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N92-27428# National Aerospace Lab., Tokyo (Japan). Advanced Aircraft Research Group.
A PRESSURE MEASUREMENT METHOD USING ELECTRONICALLY SCANNER PRESSURE SENSORS (ESP) INSTALLED IN A GUST WIND TUNNEL
Toshimi Fujita, Akihito Iwasaki, Fumiko Itou, and Hirotoshi Fujieda Jul. 1991 27 p In JAPANESE; ENGLISH summary
(NAL-TM-638; ISSN-0452-2982; JTN-92-80364) Avail: NTIS HC/MF A03

Electronically Scanner Pressure (ESP) sensors were installed at various data acquisition locations in a Gust Wind Tunnel in order to obtain pressure measurements at high speeds. However, changes in the environmental conditions, particularly flow temperature, resulted in the sensors displaying a span and zero shift, thus making them difficult to use in a long run wind tunnel tests. Experiments were subsequently performed to solve these problems, and a method was established which assured they maintain their required measurement accuracy. This method utilized the established ESP sensors system and efficiently reduced data acquisition requirements. In the case of a Short Take Off and Landing (STOL) aircraft semispan model, the time required for wake measurements was reduced by approximately equals 2 percent, i.e., the test took only one hour versus one and a half days using the previous method. Both the newly developed method and the currently used high speed pressure measuring system using ESP sensors are described. Author (NASDA)

N92-27645# Toronto Univ. (Ontario). Dept. of Aerospace Science and Engineering.
THE MODELLING OF TURBULENCE AND DOWNBURSTS FOR FLIGHT SIMULATORS Ph.D. Thesis
Paul Aaron Robinson Jun. 1990 394 p
(ISBN-0-315-59945-6; CTN-92-60468) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

This study investigates the degree of complexity required in the simulation of turbulence and thunderstorm downburst wind shear for flight simulation. A turbulence model is presented which contains all the correlations found in homogeneous isotropic turbulence. As part of the development of this turbulence model, a method is introduced by which a time series may be modulated to alter its statistical properties while not affecting its spectral properties. Several simplifications and alternate models are considered. This report also presents further developments in the simulation of thunderstorm downbursts. A single ring vortex system, a triple ring vortex system, and Joint Airport Weather Studies (JAWS) data are implemented on the University of Toronto Institute for Aerospace Studies (UTIAS) B-747 Flight Simulator. By means of pilot evaluations on this simulator, it was found that the inclusion of the isotropic turbulence correlations did not seem to affect the pilots' performance or aircraft response. Overall, spectral methods were favored as a means of generating turbulence for flight simulation. Pilot evaluations of the downburst models showed that both single and triple ring vortex systems produced similar pilot reactions to the actual downbursts (JAWS data). It is suggested that the ring vortex models be expanded upon to include more than one downburst cell. Author (CISTI)

N92-27670*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
EFFECT OF COLLECTOR CONFIGURATION ON TEST SECTION TURBULENCE LEVELS IN AN OPEN-JET WIND TUNNEL

G. S. Manuel, John K. Molloy, and P. Stephen Barna Jul. 1992 22 p
(RTOP 505-61-41-02)
(NASA-TM-4333; L-16838; NAS 1.15:4333) Avail: NTIS HC/MF A03

Flow quality studies in the Langley 14- by 22-Foot Subsonic Tunnel indicated periodic flow pulsation at discrete frequencies in the test section when the tunnel operated in an open-jet configuration. To alleviate this problem, experiments were conducted in a 1/24-scale model of the full-scale tunnel to evaluate the turbulence reduction potential of six collector configurations. As a result of these studies, the original bell-mouth collector of the 14- by 22-Foot Subsonic Tunnel was replaced by a collector with straight walls, and a slot was incorporated between the trailing edge of the collector and the entrance of the diffuser. Author

N92-27753# Pennsylvania State Univ., University Park. Applied Research Lab.
PARTICLE IMAGE VELOCIMETRY Semiannual Progress Report
S. Deutsch 12 Feb. 1992 1 p
(Contract N00014-91-J-1608)
(AD-A246638) Avail: NTIS HC/MF A01

We will develop Particle Image Velocimetry (PIV) as a viable turbulence research tool at a near-wall flow facility (glycerin tunnel). The PIV technique is used to study the influence of controlled disturbances on the fluid structure in the very near wall region and compare these results with those from an ongoing LDA study. A PIV system may be conveniently separated into two parts: an image acquisition system and an image interrogation system. The image acquisition system is now operational, while the image acquisition system is still under development. The system consists of a small Helium-Neon laser and the associated optics needed for picture illumination and transformation, an x-y traversing system for accurate slide positioning during interrogation, a CCD camera, and an image monitor. The interrogation system optically transforms a laser illumination image and then uses a Young's fringe pattern based technique to analyze the image and reconstruct the velocity field. This interrogation system is tied to a Swan 386 microcomputer and established that all the hardware and software functions properly. GRA

N92-27836# Technology Systems, Inc., North Edgecomb, ME.
DEVELOPMENT OF THE BASIC FLIGHT INSTRUCTION TUTORING SYSTEM (BFITS) Final Report, Sep. 1989 - Dec. 1991
Charles J. Benton, Paul Corriveau, Jefferson M. Koonce, and William C. Tirre Jan. 1992 28 p
(Contract F33615-89-C-0009)
(AD-A246458; AL-18) Avail: NTIS HC/MF A03

The Basic Flight Instruction Tutoring System (BFITS) is a microcomputer-based flight trainer designed to teach both the declarative and procedural knowledge needed for basic flight maneuvers, while monitoring, tracking, and recording the student's behavior as he/she works with the tutor. BFITS provides a criterion task for (1) the validation of experimental psychological tests under consideration for pilot selection, and (2) the evaluation of the effects of drugs and environmental factors on pilot performance. BFITS consists of an instructional module, a flight simulator, and a performance evaluator, which work together to involve the student in tasks requiring both cognitive and psychometer skills. The instructional module teaches the declarative knowledge of basic flight using text, graphics, and animation. The flight simulator provides the student with practice in flying a simulated airplane. It is used in conjunction with a number of easily changed flight scenarios that direct the students current task and provide performance evaluation criteria and hint messages. The performance evaluator tracks student progress and allows the student to view a graphical display of his/her performance as measured against the evaluation criteria. Flights can be played back for review also. GRA

N92-27976*# MCAT Inst., San Jose, CA.
DEVELOPMENT OF A QUIET SUPERSONIC WIND TUNNEL WITH A CRYOGENIC ADAPTIVE NOZZLE Progress Report
Stephen W. D. Wolf May 1992 68 p
(Contract NCC2-604)
(NASA-CR-188055; NAS 1.26:188055; MCAT-92-012) Avail: NTIS HC/MF A04

Aspects of the design and construction of the Laminar Flow Supersonic Wind Tunnel at the NASA-Ames Fluid Mechanics Laboratory are discussed. The wind tunnel is to be used as part of the NASA High Speed Research Program (HSRP). For individual titles, see N92-27977 through N92-27978.

N92-27977*# MCAT Inst., San Jose, CA.
DEVELOPMENT OF A QUIET SUPERSONIC WIND TUNNEL WITH A CRYOGENIC ADAPTIVE NOZZLE Annual Progress Report, Mar. 1991 - Apr. 1992
Stephen W. D. Wolf *In its* Development of a Quiet Supersonic Wind Tunnel with a Cryogenic Adaptive Nozzle May 1992 8 p
(For primary document see N92-27976 18-09)
(Contract NCC2-604)
Avail: NTIS HC/MF A04

The main objective of this work was the development of an interim quiet (low-disturbance) supersonic wind tunnel for the NASA-Ames Fluid Mechanics Laboratory (FML). This is a result of the need to bring the full-scale tunnel on-line as rapidly as possible to impact the NASA High Speed Research Program (HSRP). The development of a cryogenic adaptive nozzle and other sophisticated features of the tunnel will now happen later, after the full scale wind tunnel is in operation. Author

N92-27978*# MCAT Inst., San Jose, CA.
THE FML COMPRESSOR AS A DRIVE SYSTEM FOR THE LFSWT: A NARRATIVE
James Laub and Stephen Wolf *In its* Development of a Quiet Supersonic Wind Tunnel with a Cryogenic Adaptive Nozzle May 1992 10 p (For primary document see N92-27976 18-09)
Avail: NTIS HC/MF A04

During 1988, a feasibility study was performed to decide how best to build a Laminar Flow Supersonic Wind Tunnel (LFSWT) at the NASA-Ames Fluid Mechanics Laboratory (FML) for boundary layer transition research. A full report was received in June 1988. The report was based on the following guidelines: continuous operation at Mach numbers within the range from 1.8-4.0 was required to impact the NASA 'HiStar' project; low disturbance flow is essential for transition research; minimum test section height is 8 inches; tunnel must fit in an FML test cell; tunnel design should be simple; and construction costs should be minimized. The study considered three drive system options: (1) use surplus JPL compressors and support equipment; (2) use of the FML compressor with ambient injectors; and (3) use of the FML compressor with injectors driven by the NASA-Ames 3000 psia air supply. Author

N92-27792*# Academy of Sciences (USSR), Moscow. Central Aero-Hydrodynamic Inst.
CRYOGENIC TEST RIG WITH AN AERODYNAMIC MAGNETICALLY LEVITATED CARRIAGE
Sergey Yu. Borisov, Anton L. Iskra, and Anatoly P. Philatov *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 547-558
(For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27801*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PROPULSION SIMULATOR FOR MAGNETICALLY SUSPENDED WIND TUNNEL MODELS
P. B. Joshi, M. R. Malonson, G. P. Sacco, C. L. Goldey, K. Garbutt, M. Goodyer (Southampton Univ., England), and P. Lawing *In its* International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 709-739 (For primary document see N92-27788

18-18)
(Contract NAS1-18845)
Avail: NTIS HC/MF A20

N92-27802*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PRESENT STATUS OF THE MIT/NASA LANGLEY 6-INCH MSBS
Timothy Schott, Thomas Jordan, Taumi Daniels, and Charles Alcorn (Old Dominion Univ., Norfolk, VA.) *In its* International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 741-764 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27803*# Moscow Inst. of Aviation Technology (USSR).
PROGRESS OF MAGNETIC SUSPENSION AND BALANCE SYSTEMS FOR WIND TUNNELS IN THE USSR
A. V. Kuzin, Y. D. Vyshkov, and G. K. Shapovalov (Academy of Sciences, USSR, Moscow) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 765-774 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27804*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
WIND TUNNEL MAGNETIC SUSPENSION SYSTEMS AT THE UNIVERSITY OF SOUTHAMPTON, ENGLAND
Michael J. Goodyer *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 775-788 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N92-27931# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: SPACE
27 Jan. 1992 76 p Transl. into ENGLISH from various Central Eurasian articles
(JPRS-USP-92-001) Avail: NTIS HC/MF A05

Several topics relative to Central Eurasian space science activities are discussed. Topics covered include a gamma ray telescope on an earth orbiting satellite, satellite launches, spacecraft control, electron diffusion in the Earth radiation belt, charged particle fluxes in the magnetosphere, orbital solar electric power stations, space policy, and the MAKS air launched spaceplane. For individual titles, see N92-27932 through N92-27934.

N92-27932# Joint Publications Research Service, Arlington, VA.
GAMMA ASTRONOMY SATELLITE c18
P. N. Polezhayev and V. P. Poluektov *In its* JPRS Report: Science and Technology. Central Eurasia: Space 27 Jan. 1992 p 2-8 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 3, May - Jun. 1991 p 2-9 (For primary document see N92-27931 18-12)
Avail: NTIS HC/MF A05

On 11 July 1990, the Soviet space based Gamma observatory was launched. Gamma was designed to conduct basic research in the field of gamma ray astronomy. Despite malfunctions in the operation of the science gear, the observatory has managed to obtain new, important experimental data. The observatory design and the science instrument package are described. Author

N92-27933# Joint Publications Research Service, Arlington, VA.
ORBITAL SOLAR ELECTRIC POWER STATIONS c20
Ye. A. Narimanov and I. G. Virko, ed. *In its* JPRS Report: Science and Technology. Central Eurasia: Space 27 Jan. 1992 p 19-31 Transl. into ENGLISH from Novoye v Zhizni, Nauke, Tekhnike: Seriya Kosmonavtika, Astronomiya (Moscow, USSR), no. 3, Mar. 1991 p 1-38 (For primary document see N92-27931 18-12)
Avail: NTIS HC/MF A05

Various aspects of the development of space based solar electric power stations are discussed. Topics discussed include solar energy for the national economy, solar energy in space, a typical space-based solar electric power station, reasons for the low economic efficiency of space based solar electric power stations, the impact of solar electric power stations on the environment, the structural design of a small-scale space based solar electric power station, and the militarization of space.
Author

N92-27934# Joint Publications Research Service, Arlington, VA.
PROJECT MAKS AIR-LAUNCHED SPACEPLANE c16
V. A. Skorodelov *In its* JPRS Report: Science and Technology. Central Eurasia: Space 27 Jan. 1992 p 33-38 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 3, May - Jun. 1991 p 19-26 (For primary document see N92-27931 18-12)
Avail: NTIS HC/MF A05

The U.S. Space Shuttle and the U.S.S.R. Buran are large spacecraft that are designed to carry large payloads. Obviously, these powerful, expensive systems are no good for tasks that require taking small to medium sized cargoes to and from orbit. Such tasks need a reusable, orbital airplane that has a smaller cargo capacity and costs less to operate. A design involving a multipurpose aerospace system, called by its developers MAKS, satisfies those requirements entirely. The Spiral-Buran-MAKS represents a coherent, continuous chain of designs involving reusable space transportation systems. It is a two-stage complex in which the modified AN-225 Mriya carrier aircraft is employed as the first reusable stage. The second stage consists of the reusable orbital airplane and an expendable external fuel tank filled with fuel for the sustainer engines of the orbiter. Author

N92-27327*# Canadian Space Agency, Ottawa (Ontario). Space Station Program Office.
THE CANADIAN SPACE AGENCY, SPACE STATION, STRATEGIC TECHNOLOGIES FOR AUTOMATION AND ROBOTICS PROGRAM TECHNOLOGY DEVELOPMENT ACTIVITY IN PROTECTION OF MATERIALS FROM THE LOW EARTH ORBIT SPACE ENVIRONMENT Abstract Only
J. R. Francoeur *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 128 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

N92-27530# Naval Postgraduate School, Monterey, CA.
DESIGN OF FAST EARTH-RETURN TRAJECTORIES FROM A LUNAR BASE M.S. Thesis
Walter Anhorn Sep. 1991 71 p
(AD-A246553) Avail: NTIS HC/MF A04

The Apollo Lunar Program utilized efficient transearth trajectories which employed parking orbits in order to minimize energy requirements. This thesis concentrates on a different type of transearth trajectory. These are direct-ascent, hyperbolic trajectories which omit the parking orbits in order to achieve short flight times to and from a future lunar base. The object of the thesis is the development of a three-dimensional transearth trajectory model and associated computer program for exploring trade-offs between flight-time and energy, given various mission constraints. The program also targets the Moon with a hyperbolic trajectory, which can be used for targeting Earth impact points. The first-order model is based on an Earth-centered conic and a

massless spherical Moon, using MathCAD version 3.0. This model is intended as the basis for future patched-conic formulations for the design of fast Earth-return trajectories. Applications include placing nuclear deterrent arsenals on the Moon, various space support related activities, and finally protection against Earth-threatening asteroids and comets using lunar bases. GRA

N92-27534# Naval Postgraduate School, Monterey, CA.
PERFORMANCE ANALYSIS OF NON-COPLANAR SYNERGETIC MANEUVERS M.S. Thesis
Thomas P. Spriesterbach Dec. 1991 94 p
(AD-A246576) Avail: NTIS HC/MF A05

Maneuvers employing atmospheric forces to assist in orbital changes hold potential for significant fuel savings over purely exoatmospheric propulsive methods. The term synergetic was coined to describe the combination of propulsive and atmospheric forces used by a maneuvering flight vehicle. This thesis concentrates on non-coplanar synergetic maneuvers using two different control methods for various lifting bodies over a range of heating rates and orbital speeds. The objective of this thesis is to study the aerocruise and aerobang maneuvers. The aerocruise maneuver was first studied more than twenty years ago and is commonly thought to be the fuel-optimal solution to a maneuver flown at a constant heating rate. A new maneuver, the aerobang, has recently raised doubts as to the optimality of the aerocrusie maneuver. The aerobang maneuver demonstrates the ability to yield a higher inclination change for a given amount of fuel as compared to the aerocruise maneuver. Within this thesis a computer code is developed to model both the aerobang and aerocruise maneuvers. It is shown that there exist flight regimes where the aerobang method is superior to the aerocruise method. GRA

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.

For related information see also *20 Spacecraft Propulsion and Power.*

N92-27374 Department of the Navy, Washington, DC.
ELECTRICALLY ACTUATED MULTIPLE STORE LAUNCHER Patent
Frank P. Marshall, inventor (to Navy) and Bruce W. Travor, inventor (to Navy) 24 Dec. 1991 12 p Filed 30 Oct. 1990
(AD-D015247; US-Patent-5,074,186; US-Patent-Appl-SN-605901; US-Patent-Class-89-1.51) Avail: US Patent and Trademark Office

This invention comprises a multi-store, electrical pulse initiated launcher that fits into, and is electrically connected with a transporting vehicle and that contains sequentially stacked assemblies. An electrical pulse from the transporting vehicle causes a resistor with the least value to transfer the electric sufficient gas pressure to force the store out of the launcher. The present invention discloses an electrically-actuated, multi-store dispenser wherein an initial electrical charge ignites gas cartridges causing sequential launching of stores from their tandem position inside a launch container. In some environments, it is desirable to dispense multiple stores from a launch vehicle, for instance sonobuoys, in dense patterns. Due to physical limitations of space in the dispensing vehicle, an effort was made to miniaturize the active components inside the store and therefore reduce the overall outer dimensions thereof. Once the size of the store was reduced, in order to meet the demands of the denser patterns, the inside of the individual launch containers were modified to allow each to hold and dispense more than one store. This new type of launch container, in addition to maintaining the size requirement dictated by the transporting vehicle, is operated by the vehicle's electrical system. GRA

N92-27628 Department of the Navy, Washington, DC.
FIRING ASSEMBLY FOR STORED ENERGY LAUNCHER Patent
Gary R. Berlam, inventor (to Navy), Laurent C. Bissonnette, inventor (to Navy), Nicholas Bitsakis, inventor (to Navy), Peter R. Bodycoat, inventor (to Navy), and George M. Duarte, inventor (to Navy) 4 Feb. 1992 5 p Filed 7 Feb. 1991
(AD-D015240; US-Patent-5,085,122; US-Patent-Appl-SN-652155; US-Patent-Class-89-1.81) Avail: US Patent and Trademark Office

A firing assembly for a stored energy projectile launcher of the type having an energy storage device that is pressurized by a fluid. The projectile is mechanically latched in its launch tube and the aft end of the projectile cooperates with the breach end of the launch tube to define a breach chamber that communicates with and is pressurized with the bladder. A valve in a line from the breach chamber is electrically controlled to move a piston and release the mechanical latch when fluid pressure is provided to the piston chamber. The pressure used to overcome the force needed to raise the piston is taken from the energy storage device. No addition of energy to the system is required, with the exception of a short electrical impulse signal, to open a full port valve acting instantaneously on the rear face of the projectile. GRA

N92-27902# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Wessling (Germany, F.R.). Inst. for Flight Systems Dynamics.
OPTIMAL GUIDANCE ANTICIPATING MISSILE PERFORMANCE
W. Grimm and K. H. Well *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 13 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance.* For space suits see *54 Man/System Technology and Life Support.*

N92-27540*# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
PROJECT UM-HAUL (UNMANNED HEAVY PAYLOAD UNLOADER AND LANDER): THE DESIGN OF A REUSABLE LUNAR LANDER WITH AN INDEPENDENT CARGO UNLOADER Final Report
Apr. 1991 215 p Original contains color illustrations
(Contract NASw-4435)
(NASA-CR-189971; NAS 1.26:189971) Avail: NTIS HC/MF A10; 1 functional color page

Project UM-Haul is the preliminary design of a reusable lunar transportation vehicle that travels between a lunar parking orbit and the lunar surface. This vehicle is an indispensible link in the overall task of establishing a lunar base as defined by the NASA Space Exploration Initiative. The response to this need consists

of two independent vehicles: a lander and an unloader. The system can navigate and unload itself with a minimum amount of human intervention. The design addresses structural analysis, propulsion, power, controls, communications, payload handling and orbital operations. The Lander has the capacity to decend from low lunar orbit (LLO) to the lunar surface carrying a 7000 kg payload, plus the unloader, plus propellant for ascent to LLO. The Lander employs the Unloader by way of a motorized ramp. The Unloader is a terrain vehicle capable of carrying cargoes of 8,500 kg mass and employs a lift system to lower payloads to the ground. The system can perform ten missions before requiring major servicing. Author

N92-27934# Joint Publications Research Service, Arlington, VA.
PROJECT MAKS AIR-LAUNCHED SPACEPLANE
V. A. Skorodelov *In its* JPRS Report: Science and Technology. Central Eurasia: Space 27 Jan. 1992 p 33-38 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 3, May - Jun. 1991 p 19-26 (For primary document see N92-27931 18-12)
Avail: NTIS HC/MF A05

17 SPACE COMM., SPACECRAFT COMM., COMMAND & TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

N92-27994# Naval Postgraduate School, Monterey, CA.
DEVELOPMENT OF TELEMETRY FOR THE AGILITY FLIGHT TEST OF A RADIO CONTROLLED FIGHTER MODEL M.S. Thesis
Michael J. Gallagher Mar. 1992 90 p
(AD-A248653) Avail: NTIS HC/MF A05

Advanced design tools, control devices, and supermaneuverability concepts provide innovative solutions to traditional aircraft design trade-offs. Emerging technologies enable improved agility throughout the performance envelope. Unmanned Air Vehicles provide an excellent platform for dynamic measurements and agility research. A 1/8-scaled F-16A ducted-fan radio-controlled aircraft was instrumented with a telemetry system to acquire angle of attack, sideslip angle, control surface deflection, throttle position, and airspeed data. A portable ground station was built to record and visually present real-time telemetry data. Flight tests will be conducted to acquire baseline high angle-of-attack performance measurements, and follow-on research will evaluate agility improvements with varied control configurations. GRA

N92-28219*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
OPTICAL TERMINAL DEFINITION FOR THE FUTURE SERVICE GROWTH (FSG) MODULE OF THE ADVANCED TRACKING AND DATA RELAY SATELLITE (ATDRSS)
Ronald C. Bruno (Stanford Telecommunications, Inc., Reston, VA.) and Ford Kalil 10 Apr. 1992 10 p Presented at the 14th International Communication Satellite Systems Conference, AIAA, Washington, DC, 22-26 Mar. 1992 Previously announced in IAA as A92-29782
(Contract NAS5-31260)
(NASA-CR-189270; NAS 1.26:189270) Avail: NTIS HC/MF A02

Results are presented from preliminary analyses and definition studies for an optical terminal's incorporation into the FSG module of the ATDRS system, which must support crosslinks between selected relay satellites of a modified ATDRS constellation and, thereby, allow the placement of a relay satellite at an orbital location which eliminates the zone of exclusion. Author

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics,* and *16 Space Transportation.*

N92-27388# Mitre Corp., McLean, VA.
SMALL SATELLITES AND RPAs IN GLOBAL-CHANGE RESEARCH, SUMMARY AND CONCLUSIONS
P. Banks, J. M. Cornwall, F. Dyson, N. Fortson, and S. Koonin Jan. 1992 29 p
(AD-A247855; JSR-91-330A) Avail: NTIS HC/MF A03

JASON has now conducted two studies on the use of small satellites and remotely-piloted aircraft (RPA's) in global change research, with special reference to the DOE Atmospheric Radiation Measurement (ARM) Program and to DARPA's Small Satellite Program. The studies centered around meetings, one in January and the other in June, 1991, to which we invited representatives of all areas of the global change program and of the DOD satellite science and technology community. We have already issued a report on the January study. Here we summarize the main themes and results of our summer study. GRA

N92-27541*# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
PROJECT MEDSAT: THE DESIGN OF A REMOTE SENSING PLATFORM FOR MALARIA RESEARCH AND CONTROL Final Report
Apr. 1991 199 p
(Contract NASw-4435)
(NASA-CR-190008; NAS 1.26:190008) Avail: NTIS HC/MF A09

Project MEDSAT was proposed with the specific goal of designing a satellite to remotely sense pertinent information useful in establishing strategies to control malaria. The 340 kg MEDSAT satellite is to be inserted into circular earth orbit aboard the Pegasus Air-Launched Space Booster at an inclination of 21 degrees and an altitude of 473 km. It is equipped with a synthetic aperture radar and a visible thermal/infrared sensor to remotely sense conditions at the target area of Chiapas, Mexico. The orbit is designed so that MEDSAT will pass over the target site twice each day. The data from each scan will be downlinked to Hawaii for processing, resulting in maps indicating areas of high malaria risk. These will be distributed to health officials at the target site. A relatively inexpensive launch by Pegasus and a design using mainly proven, off-the-shelf technology permit a low mission cost, while innovations in the satellite controls and the scientific instruments allow a fairly complex mission. Author

N92-27555*# Naval Postgraduate School, Monterey, CA.
SPACECRAFT DESIGN PROJECT MULTIPURPOSE SATELLITE BUS MPS
Lyle Kellman, John Riley, Michael Szostak, Joseph Watkins, Joseph Willhelm, and Gary Yale Dec. 1990 270 p
(Contract NASw-4435)
(NASA-CR-190009; NAS 1.26:190009) Avail: NTIS HC/MF A12

The thrust of this project was to design not a single spacecraft, but to design a multimission bus capable of supporting several current payloads and unnamed, unspecified future payloads. Spiraling costs of spacecraft and shrinking defense budgets necessitated a fresh look at the feasibility of a multimission spacecraft bus. The design team chose two very diverse and different payloads, and along with them two vastly different orbits, to show that multimission spacecraft buses are an area where indeed more research and effort needs to be made. Tradeoffs, of course, were made throughout the design, but optimization of subsystem components limited weight and volume penalties, performance degradation, and reliability concerns. Simplicity was chosen over more complex, sophisticated and usually more efficient

designs. Cost of individual subsystem components was not a primary concern in the design phase, but every effort was made to chose flight tested and flight proven hardware. Significant cost savings could be realized if a standard spacecraft bus was indeed designed and purchased in finite quantities. Author

N92-27612# Toronto Univ. (Ontario).
OPTIMAL CONTROL OF LARGE SPACE STRUCTURES USING DISTRIBUTED GYRICITY: A CONTINUUM APPROACH Ph.D. Thesis
Christopher John Damaren 18 Jan. 1990 212 p
(ISBN-0-315-56953-0; CTN-92-60467) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Continuum modeling is used for the analysis of large space structures (LSS) that employ a collection of control moment gyros (CMGs) for vibration control. These devices, which consist of a spinning wheel in gimbals, act as torque sources when the orientation of the wheel is changed. In this model, a system of control moment gyros is replaced with the gyricity distribution (the density of stored angular momentum) and its associated distribution of gimbal angles. A first-order perturbation approach is presented for determining the changes in the modal characteristics due to light damping. The completeness properties of the damped, gyroelastic eigenfunctions are established which permits the damped modal equations of motion to be derived. Controllability and observability conditions for this class of structural model are found in terms of the modal information (frequencies and mode shapes). An optimal control problem with quadratic performance index is formulated in continuum terms. A modal approximation scheme is adopted from which the feedback law, optimal trajectory, and the performance index can be calculated. The sensitivity of the optimum with respect to the gyricity distribution, which can be interpreted as an actuator location function, is determined and is used to optimize the location of CMGs for vibration suppression. Results are illustrated using classical beam and plate models which are representative of structural modules planned for use in LSS applications. The resulting control systems are very successful in suppressing the structural vibrations. Author (CISTI)

N92-27613# Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
ON THE STABILITY OF A DUAL SPIN SATELLITE WITH ASYMMETRIC ROTOR AND FLEXIBLE PLATFORM Ph.D. Thesis
Zvi Viderman 7 Jun. 1989 223 p
(ISBN-0-315-54650-6; CTN-92-60472) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The stability problem of a force free dual spin satellite which comprises an asymmetric rigid rotor and a flexible platform is addressed. Two cases are investigated, the case where the rotor is free from axial torques, and the case where the spin rate of the rotor relative to the platform is maintained constant. A minimum number of the nonlinear equations of motion are derived directly by a hybrid method, which combines Euler and Lagrange equations, without the necessity to deal explicitly with internal forces and to consider forces of constraints. Conditions for the existence of pure spin motion are obtained, and the equations of motion are linearized about this motion. The linearized equations of motion of such a system are characterized by periodic coefficients which appear also in the mass matrix and by gyroscopic terms. A special type of satellite is found, in which the number of linearized equations may be reduced. It is shown that the relation between the stability of the linearized system and the local stability of the actual non-linear system differs from the relation of satellites with axisymmetric rotor in case the rotor is axially torque free. Two methods for stability analysis are developed, the first a modification of Hsu's numerical scheme and the second a perturbation method based on the multiple scales method. Three numerical examples are investigated. These examples are a rigid platform, a platform with rigid core and point mass damper, and a rigid core and beam-like antenna. Author (CISTI)

N92-27646# British Columbia Univ., Vancouver. Dept. of Mechanical Engineering.
DYNAMICS AND CONTROL OF AN ORBITING SPACE PLATFORM BASED TETHERED SATELLITE SYSTEM Ph.D. Thesis
Prem Kumar Lakshmanan Oct. 1989 249 p
(ISBN-0-315-56001-0; CTN-92-60470) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

A relatively general mathematical model is proposed for studying the coupled attitude dynamics of space platform supported tethered subsatellite systems accounting for offset of the tether attachment point. The offset is treated as a function of time subject to constraints. General energy expressions allowing for flexibility of the tether as well as the platform are derived. The second order coupled, nonlinear, non-autonomous, differential equations are linearized about a quasi-static equilibrium position, are collated into matrix form and solved linearly. An extensive response analysis is carried out over a range of system parameters, operational maneuvers and orbit eccentricity to assess complex interactions involved and help evolve suitable control strategies. Two control schemes, tether tension modulation and thruster control, are extended to the case of an offset of the tether attachment point. It is shown that a linear control strategy is sufficient to control the tether in-plane as well as out of plane vibrations in the presence of out-of-plane effects. A new approach to control of platform based tethered satellite systems utilizing motion of the offset to control the coupled system dynamics is proposed.
Author (CISTI)

N92-27721*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
INTERNATIONAL SYMPOSIUM ON MAGNETIC SUSPENSION TECHNOLOGY, PART 1
Nelson J. Groom, ed. and Colin P. Britcher, ed. (Old Dominion Univ., Norfolk, VA.) Washington May 1992 470 p Symposium held in Hampton, VA, 19-23 Aug. 1991
(RTOP 590-14-11-02)
(NASA-CP-3152-Pt-1; L-17092-Pt-1; NAS 1.55:3152-Pt-1) Avail: NTIS HC/MF A20

The goal of the symposium was to examine the state of technology of all areas of magnetic suspension and to review related recent developments in sensors and controls approaches, superconducting magnet technology, and design/implementation practices. The symposium included 17 technical sessions in which 55 papers were presented. The technical session covered the areas of bearings, sensors and controls, microgravity and vibration isolation, superconductivity, manufacturing applications, wind tunnel magnetic suspension systems, magnetically levitated trains (MAGLEV), space applications, and large gap magnetic suspension systems. For individual titles, see N92-27722 through N92-27747.

N92-27722*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OVERVIEW OF MAGNETIC SUSPENSION RESEARCH AT LANGLEY RESEARCH CENTER **c37**
Nelson J. Groom *In its* International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 3-23 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

An overview of research in small- and large-gap magnetic suspension systems at LaRC is presented. The overview is limited to systems which have been built as laboratory models or engineering models. Small-gap systems applications include the Annular Momentum Control Device (AMCD), which is a momentum storage device for the stabilization and control of spacecraft, and the Annular Suspension and Pointing System (ASPS), which is a general purpose pointing mount designed to provide orientation,

mechanical isolation, and fine pointing space experiments. These devices are described and control and linearization approaches for the magnetic suspension systems for these devices are discussed. Large-gap systems applications at LaRC have been almost exclusively wind tunnel magnetic suspension systems. A brief description of these efforts is also presented. Author

N92-27723*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
PROFESSOR JESSE W. BEAMS AND THE FIRST PRACTICAL MAGNETIC SUSPENSION c37
P. E. Allaire, R. R. Humphris, and D. W. Lewis *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 25-32 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Dr. Jesse W. Beams developed the first practical magnetic suspension for high speed rotating devices. The devices included high speed rotating mirrors, ultracentrifuges, and high speed centrifugal field rotors. A brief biography of Dr. Beams is presented, and the following topics are discussed: (1) early axial magnetic suspension for ultracentrifuges; and (2) magnetic suspension for high centrifugal fields. Author

N92-27724*# Old Dominion Univ., Norfolk, VA. Dept. of Mechanical Engineering and Mechanics.
LARGE-GAP MAGNETIC SUSPENSION SYSTEMS c37
Colin P. Britcher *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 33-49 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

The classification of magnetic suspension devices into small-gap and large-gap categories is addressed. The relative problems of position sensing, control systems, power supplies, electromagnets, and magnetic field or force analysis are discussed. The similarity of all systems from a controls standpoint is qualified. Some applications where large-gap technology is being applied to systems with a physically small air-gap are mentioned. Finally, the applicability of some other suspension approaches, such as electrodynamic or superconducting are briefly addressed. Author

N92-27725*# Societe Europeenne de Propulsion, Vernon (France).
MAGNETIC BEARINGS: A KEY TECHNOLOGY FOR ADVANCED ROCKET ENGINES? c37
J. Ph. Girault *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 53-72 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

For several years, active magnetic bearings (AMB) have demonstrated their capabilities in many fields, from industrial compressors to control wheel suspension for spacecraft. Despite this broad area, no significant advance has been observed in rocket propulsion turbomachinery, where size, efficiency, and cost are crucial design criteria. To this respect, Societe Europeenne de Propulsion (SEP) had funded for several years significant efforts to delineate the advantages and drawbacks of AMB applied to rocket propulsion systems. Objectives of this work, relative technological basis, and improvements are described and illustrated by advanced turbopump layouts. Profiting from the advantages of compact design in cryogenic environments, the designs show considerable improvements in engine life, performances, and reliability. However, these conclusions should still be tempered by high recurrent costs, mainly due to the space-rated electronics. Development work focused on this point and evolution of electronics show the possibility to decrease production costs by an order of magnitude. Author

N92-27726*# Ingersoll-Rand Co., Phillipsburg, NJ.
ACTIVE MAGNETIC BEARINGS: AS APPLIED TO CENTRIFUGAL PUMPS c37
Lev Nelik, Paul Cooper, Graham Jones, Dennis Galecki, Frank Pinckney, and Gordon Kirk (Virginia Polytechnic Inst. and State Univ., Blacksburg.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 73-88 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Application of magnetic bearings to boiler feed pumps presents various attractive features, such as longer bearing life, lower maintenance costs, and improved operability through control of the rotordynamics. Magnetic bearings were fitted to an eight-stage, 600 hp boiler feed pump, which generates 2600 ft of heat at 680 gpm and 3560 rpm. In addition to the varied and severe operating environment in steady state operation of this pump in a power plant, it is also subjected to transient loads during frequent starts and stops. These loads can now be measured by the in-built instrumentation of the magnetic bearings. Following site installation, a follow-up bearing tune-up was performed, and pump transient response testing was conducted. The bearing response was completely satisfactory, ensuring trouble-free pump operation even in the range of reduced load. The experience gained so far through design and testing proves feasibility of magnetic bearings for boiler feed pumps, which sets the stage for application of even higher energy centrifugal pumps equipped with magnetic bearings. Author

N92-27727*# North Carolina Univ., Charlotte. Dept. of Electrical Engineering.
PRECISION MAGNETIC SUSPENSION LINEAR BEARING c37
David L. Trumper and Michael A. Queen *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 89-103 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

We have shown the design and analyzed the electromechanics of a linear motor suitable for independently controlling two suspension degrees of freedom. This motor, at least on paper, meets the requirements for driving an X-Y stage of 10 Kg mass with about 4 m/sq sec acceleration, with travel of several hundred millimeters in X and Y, and with reasonable power dissipation. A conceptual design for such a stage is presented. The theoretical feasibility of linear and planar bearings using single or multiple magnetic suspension linear motors is demonstrated. Author

N92-27728*# Maryland Univ., College Park. Dept. of Mechanical Engineering.
MODELLING AND DESIGN FOR PM/EM MAGNETIC BEARINGS c37
D. Pang, J. A. Kirk, D. K. Anand, R. G. Johnson, and R. B. Zmood (Royal Melbourne Inst. of Tech., Australia) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 105-120 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

A mathematical model of a permanent magnet/electromagnet (PM/EM) radially active bearing is presented. The bearing is represented by both a reluctance model and a stiffness model. The reluctance model analyzes the magnetic circuit of the PM/EM bearings. By combining the two models, the performance of the bearing can be predicted given geometric dimensions, permanent magnet strength, and the parameters of the EM coils. The overall bearing design including the PM and EM design is subject to the performance requirement and physical constraints. A study of these requirements and constraints is discussed. The PM design is based on the required magnetic flux for proper geometric dimensions and magnet strength. The EM design is based on the stability and force slew rate consideration, and dictates the number of turns for the EM coils and the voltage and current of the power amplifier. An overall PM/EM bearing design methodology is proposed and a case study is also demonstrated. Author

N92-27729*# SatCon Technology Corp., Cambridge, MA.
APPLICATION OF NARROW BAND CONTROL TO REDUCE VIBRATIONS IN MAGNETIC BEARING SYSTEMS c37
Monique S. Gaffney and Bruce G. Johnson *In* NASA. Langley

Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 123-147 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

The benefits of narrowband control theory for simple, open-loop stable systems are illustrated, and how the approach changes for magnetic bearing systems, which are open-loop unstable, is discussed. Magnetic bearing systems are good applications for narrowband control theory. Two sources of synchronous forces, the measurement error and the magnetic unbalance, are discussed. Both the measurement error and the magnetic unbalance manifest themselves as synchronous disturbances. It is shown that narrowband control theory for simple, open-loop stable systems provides excellent performance and good stability robustness. Because magnetic bearing systems are open-loop stable, the narrowband control approach becomes more complex. Disturbance accommodating control (DAC) theory is introduced as an effective approach to reduce vibrations in magnetic bearing systems. It is used to develop a control/estimation scheme that enables the rotor to spin about its center of mass in the presence of the measurement error disturbances. Author

N92-27730*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
DYNAMICS AND CONTROL OF HIGH PRECISION MAGNETICALLY LEVITATED VIBRATION ISOLATION SYSTEMS **c37**
K. Youcef-Toumi and T-J. Yeh *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 149-180 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Vibration control of flexible structures has received a great deal of interest in recent years. Several authors have investigated this topic in the areas of robot manipulators, space structures, and flexible rotors. Key issues associated with the dynamics and control of vibration isolation systems are addressed. Among other important issues to consider in the control of such systems, the location and number of actuators and sensors are essential to effectively control and suppress vibration. We first address the selection of proper actuator and sensor locations leading to a controllable and observable system. The Rayleigh-Ritz modal analysis method is used to develop a lumped-parameter model of a flexible vibration isolation table top. This model is then used to investigate the system's controllability and observability including the coupling effects introduced by the magnetic bearing. This analysis results in necessary and sufficient conditions for proper selection of actuator and sensor locations. These locations are also important for both controller system's complexity and stability of point of views. A favorable pole-zero plot of the open loop transfer functions is presented. Necessary and sufficient conditions for reducing the controller complexity are derived. The results are illustrated by examples using approximate mode shape functions. Author

N92-27731*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
STABILITY AND PERFORMANCE OF NOTCH FILTER CONTROL FOR UNBALANCE RESPONSE **c37**
C. R. Knospe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 181-205 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Many current applications of magnetic bearings for rotating machinery employ notch filters in the feedback control loop to reduce the synchronous forces transmitted through the bearings. The capabilities and limitations of notch filter control are investigated. First, a rigid rotor is examined with some classical root locus techniques. Notch filter control is shown to result in conditional stability whenever complete synchronous attenuation is required. Next, a nondimensional parametric symmetric flexible three mass rotor model is constructed. An examination of this model for several test cases illustrates the limited attenuation possible with notch filters at and near the system critical speeds when the bearing damping is low. The notch filter's alteration of the feedback loop is shown to cause stability problems which limits performance. Poor transient response may also result. A high speed compressor is then examined as a candidate for notch filter control. A collocated 22 mass station model with lead-lag control is used. The analysis confirms the reduction in stability robustness that can occur with notch filter control. It is concluded that other methods of synchronous vibration control yield greater performance without compromising stability. Author

N92-27732*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
A SIX DEGREE-OF-FREEDOM MAGNETIC BEARING FOR MICROGRAVITY VIBRATION ISOLATION **c37**
A. Peter Allan and Carl R. Knospe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 209-218 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

A design for a magnetic bearing, proposed as the fine stage of a coarse-fine actuator for microgravity vibration isolation, is presented. The bearing is novel in that it uses a geometry that has just three independent flux path systems. This contrasts the twelve flux path systems (six bidirectional thrust bearings) used in conventional designs. The design results in compactness, light weight, and high performance when compared with the published designs. A control system is proposed to reject disturbances caused by an umbilical connection to the experiment. Author

N92-27733*# SatCon Technology Corp., Cambridge, MA.
A SIX DEGREE-OF-FREEDOM LORENTZ VIBRATION ISOLATOR WITH NONLINEAR CONTROLLER **c37**
Ralph C. Fenn *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 219-244 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

The results of a phase 2 Small Business Innovation Research Program sponsored by MSFC are presented. Technology is developed for isolating acceleration sensitive microgravity experiments from structural vibration of a spacecraft, such as a space station. Two hardware articles are constructed: a six degree of freedom Lorentz force isolation and a one degree of freedom low acceleration testbed capable of tests at typical experiment accelerations. Author

N92-27734*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
RECENT PROGRESS TOWARDS DEVELOPING A HIGH FIELD, HIGH-T(SUB c) SUPERCONDUCTING MAGNET FOR MAGNETIC SUSPENSION AND BALANCE SYSTEMS **c37**
L. Pierre deRochemont, Carlton E. Oakes, Michael R. Squillante, Hong-Min Duan, Allen M. Hermann, Robert J. Andrews, Roger B. Poeppel, Victor A. Maroni (Argonne National Lab., IL.), Ingrid A. Carlberg, and Warren C. Kelliher *In its* International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 247-266 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

This paper reviews superconducting magnets and high T(sub c) superconducting oxide ceramic materials technology to identify areas of fundamental impasse to the fabrication of components and devices that tap what are believed to be the true potential of these new materials. High T(sub c) ceramics pose problems in fundamentally different areas which need to be solved unlike low T(sub c) materials. The authors map out an experimental plan designed to research process technologies which, if suitably implemented, should allow these deficiencies to be solved. Finally, assessments are made of where and on what regimes magnetic system designers should focus their attention to advance the practical development of systems based on these new materials. H.A.

N92-27735*# Academy of Sciences (USSR), Moscow. Inst. of Chemical Physics.
LEVITATION OF YBa2Cu3O(7-x) SUPERCONDUCTOR IN A VARIABLE MAGNETIC FIELD **c37**
Alexander N. Terentiev and Anatoliy A. Kuznetsov *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 267-278 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

The influence of both a linear alternating and rotational magnetic field component on the levitation behavior of a YBa2Cu3O(7-x) superconductor was examined. The transition from a plastic regime of levitation to an elastic one, induced by an alternating field component, was observed. An elastic regime in contrast to a plastic one is characterized by the unique position of stable levitation and field frequency dependence of relaxation time to this position. It was concluded that the vibrations of a magnet levitated above the superconductor can induce a transition from a plastic regime of levitation to an elastic one. It was found that a rotational magnetic field component induced rotations of a levitated superconductor. Rotational frictional motion of flux lines is likely to be an origin of torque developed. A prototype of a motor based on a levitated superconductor rotor is proposed. Author

N92-27736*# Houston Univ., TX. Center for Superconductivity.
HYBRID SUPERCONDUCTING MAGNETIC BEARING (HSMB) FOR HIGH LOAD DEVICES **c37**
C. K. McMichael, K. B. Ma, M. A. Lamb, M. W. Lin (California Inst. of Tech., Pasadena.), L. Chow, R. L. Meng, P. H. Hor, and W. K. Chu *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 279-287 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Lifting capacities greater than 41 N/cm(exp 2) (60 psi) at 77 K have been achieved with a new type of levitation (hybrid) using a combination of permanent magnets and high quality melt-mixtured YBa2Cu3O(7-delta) (YBCO). The key concept of the hybrid superconducting magnetic bearing (HSMB) is the use of strong magnetic repulsion and attraction from permanent magnets for high levitation or suspension forces in conjunction with a superconductor's flux pinning characteristics to counteract the inherent instabilities in a system consisting of magnets only. To illustrate this concept, radial and axial forces between magnet/superconductor, magnet/magnet, and magnet/ superconductor/magnet, were measured and compared for the thrust bearing configuration Author

N92-27737*# Koyo Seiko Co. Ltd., Kokubuhiganjo (Japan).
CHARACTERIZATION OF SUPERCONDUCTING MAGNETIC BEARINGS (DYNAMIC STIFFNESS AND DAMPING COEFFICIENT IN AXIAL DIRECTION) **c37**
Ryoichi Takahata, Hirochika Ueyama, and Tsutom Yotsuya (Osaka Prefectural Industrial Technology Research Inst., Enokojima, Japan) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 289-296 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

High T(sub c) superconductor as a stator and permanent magnets for a rotor were assembled into a superconducting magnetic bearing. The dynamic stiffness and the damping coefficient of the superconducting magnetic bearing in axial direction were measured. The dynamic stiffness depended on an axial gap between superconductor and permanent magnet. The superconducting magnetic bearings are advantageous for a passive bearing, because they have a vibration damping effect that a permanent magnet bearing does not have. The tendency of its vibration damping coefficient indicated an increase as the resonant frequency increased. Author

N92-27738*# Pratt and Whitney Aircraft, East Hartford, CT.
FEASIBILITY OF MAGNETIC BEARINGS FOR ADVANCED GAS TURBINE ENGINES **c37**
David Hibner and Lewis Rosado (Wright Lab., Wright-Patterson AFB, OH.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 299-316 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

The application of active magnetic bearings to advanced gas turbine engines will provide a product with major improvements compared to current oil lubricated bearing designs. A rethinking of the engine rotating and static structure design is necessary and will provide the designer with significantly more freedom to meet the demanding goals of improved performance, increased durability, higher reliability, and increased thrust to weight ratio via engine weight reduction. The product specific technology necessary for this high speed, high temperature, dynamically complex application has been defined. The resulting benefits from this approach to aircraft engine rotor support and the complementary engine changes and improvements have been assessed. Author

N92-27739*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
LOW POWER MAGNETIC BEARING DESIGN FOR HIGH SPEED ROTATING MACHINERY **c37**
P. E. Allaire, E. H. Maslen, R. R. Humphris, C. K. Sortore, and P. A. Studer (Magnetic Concepts, Silver Spring, MD.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 317-329 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Magnetic suspension technology has advanced to the point of being able to offer a number of advantages to a variety of applications in the rotating machinery and aerospace fields. One strong advantage is the decrease in power consumption. The design and construction of a set of permanent magnet biased, actively controlled magnetic bearing for a flexible rotor are presented. Both permanent magnets and electromagnets are used in a configuration which effectively provides the necessary fluxes in the appropriate air gaps, while simultaneously keeping the undesirable destabilizing forces to a minimum. The design includes two radial bearings and a thrust bearing. The theoretical development behind the design is briefly discussed. Experimental performance results for a set of operating prototype bearings is presented. The results include measurements of load capacity, bearing stiffness and damping, and the dynamic response of the rotor. With few exceptions, the experimental results matched very well with the predicted performance. The power consumption of these bearings was found to be significantly reduced from that for a comparable set of all electromagnetic bearings. Author

N92-27740*# Moscow Inst. of Aviation Technology (USSR).
PROGRESS OF MAGNETIC SUSPENSION SYSTEMS AND MAGNETIC BEARINGS IN THE USSR **c37**
A. V. Kuzin *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 331-359 Previously announced in IAA as A91-38579 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

This paper traces the development and progress of magnetic suspension systems and magnetic bearings in the USSR. The paper describes magnetic bearings for turbomachines, magnetic suspension systems for vibration isolation, some special measuring devices, wind tunnels, and other applications. The design, principles of operation, and dynamic characteristics of the system are presented. Author

N92-27741*# Virginia Univ., Charlottesville. Center for Innovative Technology.
EXTENDED H2 SYNTHESIS FOR MULTIPLE DEGREE-OF-FREEDOM CONTROLLERS **c37**
R. David Hampton and Carl R. Knospe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 363-383 Sponsored in part by NASA. Lewis Research Center; and by Center for

Innovative Technology of the Commonwealth of Virginia (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

H2 synthesis techniques are developed for a general multiple-input-multiple-output (MIMO) system subject to both stochastic and deterministic disturbances. The H2 synthesis is extended by incorporation of anticipated disturbances power-spectral-density information into the controller-design process, as well as by frequency weightings of generalized coordinates and control inputs. The methodology is applied to a simple single-input-multiple-output (SIMO) problem, analogous to the type of vibration isolation problem anticipated in microgravity research experiments. Author

N92-27742*# North Carolina Univ., Charlotte. Dept of Electrical Engineering.
EXPERIMENTAL RESULTS IN NONLINEAR COMPENSATION OF A ONE DEGREE-OF-FREEDOM MAGNETIC SUSPENSION **c37**
David L. Trumper, James C. Sanders, Tiep H. Nguyen, and Michael A. Queen *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 385-400 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Nonlinear control techniques are of increasing interest in magnetic bearing applications. A one-degree-of-freedom magnetic suspension system has been constructed to serve as a test system for nonlinear control. The objective of this effort is to build an accurate model for the nonlinear suspension dynamics and to show the advantages of compensating for these nonlinearities by using a nonlinear controller. The results obtained with a nonlinear controller are experimentally demonstrated as superior to those obtained with a linear controller. Specifically, a controller which contains a force-control block yields transient responses which are largely independent of the operating point air gap. H.A.

N92-27743*# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Mechatronics Lab.
CONTROL CONCEPTS FOR ACTIVE MAGNETIC BEARINGS **c37**
Roland Siegwart, D. Vischer, R. Larsonneur, R. Herzog, Alfons Traxler (MECOS Traxler A.G., Winterthur, Switzerland), H. Bleuler, and G. Schweitzer *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 401-422 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Active Magnetic Bearings (AMB) are becoming increasingly significant for various industrial applications. Examples are turbo-compressors, centrifuges, high speed milling and grinding spindles, vibration isolation, linear guides, magnetically levitated trains, vacuum and space applications. Thanks to the rapid progress and drastic cost reduction in power- and micro-electronics, the number of AMB applications is growing very rapidly. Industrial uses of AMBs leads to new requirements for AMB-actuators, sensor systems, and rotor dynamics. Especially desirable are new and better control concepts to meet demand such as low cost AMB, high stiffness, high performance, high robustness, high damping up to several kHz, vibration isolation, force-free rotation, and unbalance cancellation. This paper surveys various control concepts for AMBs and discusses their advantages and disadvantages. Theoretical and experimental results are presented. Author

N92-27744*# Tsinghua Univ., Bejing (China). Lab. of Mechatronics and Control.
COMPUTER AIDED DESIGN OF DIGITAL CONTROLLER FOR RADIAL ACTIVE MAGNETIC BEARINGS **c37**
Zhong Cai, Zupei Shen, Zuming Zhang (Beijing Inst. of Printing, China), and Hongbin Zhao *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 423-431 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

A five degree of freedom Active Magnetic Bearing (AMB) system is developed which is controlled by digital controllers. The model of the radial AMB system is linearized and the state equation is derived. Based on the state variables feedback theory, digital controllers are designed. The performance of the controllers are evaluated according to experimental results. The Computer Aided Design (CAD) method is used to design controllers for magnetic bearings. The controllers are implemented with a digital signal processing (DSP) system. The control algorithms are realized with real-time programs. It is very easy to change the controller by changing or modifying the programs. In order to identify the dynamic parameters of the controlled magnetic system, a special experiment was carried out. Also, the online Recursive Least Squares (RLS) parameter identification method is studied. It can be realized with the digital controllers. Online parameter identification is essential for the realization of an adaptive controller. Author

N92-27745*# Virginia Univ., Charlottesville. Center for Magnetic Bearings.
A MICROGRAVITY VIBRATION ISOLATION RIG **c37**
Bibhuti B. Banerjee, Carl R. Knospe, and Paul E. Allaire *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 435-456 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

It is well known that the spacecraft environment deviates from a state of zero gravity due to various random as well as repetitive sources. Science experiments that require a microgravity environment must therefore be isolated from these disturbances. Active control of noncontact magnetic actuators enables such isolation. A one degree of freedom test rig has been constructed to demonstrate the isolation capability achievable using magnetic actuators. A cylindrical mass on noncontacting electromagnetic supports simulates a microgravity experiment on board an orbiter. Disturbances generated by an electrodynamic shaker are transmitted to the mass via dashpots representing umbilicals. A compact Lorentz actuator has been designed to provide attenuation of this disturbance. Author

N92-27746*# TG and C Associates, Inc., Falmouth, VA.
VIBRATION DAMPING OF ELASTIC WAVES IN ELECTRICALLY CONDUCTING MEDIA SUBJECTED TO HIGH MAGNETIC FIELDS **c37**
T. G. Horwath *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 457-471 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

The propagation of vibrational energy in bulk, torsional, and flexural modes, in electrically conducting media can undergo strong attenuation if subjected to high magnetic fields in certain spatial arrangements. The reasons for this are induced Eddy currents which are generated by the volume elements in the media moving transversally to the magnetic field at acoustic velocities. In magnetic fields achievable with superconductors, the non-conservative (dissipative) forces are compared to the elastic and inertial forces for most metals. Strong dissipation of vibrational energy in the form of heat takes place as a result. A simplified theory is presented based on engineering representations of electrodynamics, attenuation values for representative metals are calculated, and problems encountered in formulating a generalized theory based on electrodynamics of moving media are discussed. General applications as well as applications specific to maglev are discussed. Author

N92-27747*# British Columbia Univ., Vancouver. Dept. of Electrical Engineering.
COARSE-FINE RESIDUAL GRAVITY CANCELLATION SYSTEM WITH MAGNETIC LEVITATION **c37**
S. E. Salcudean, H. Davis, C. T. Chen, D. E. Goertz, and B. V.

Tryggvason (Canadian Space Agency, Ottawa, Ontario) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 473-492 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

Aircraft flight along parabolic trajectories have been proposed and executed in order to achieve low cost, near free fall conditions of moderate duration. This paper describes a six degree of freedom experiment isolation system designed to cancel out residual accelerations due to mechanical vibrations and errors in aircraft trajectory. The isolation system consists of a fine motion magnetic levitator whose stator is transported by a conventional coarse motion stage. The levitator uses wide gap voice coil actuators and has the dual purpose of isolating the experiment platform from aircraft vibrations and actively cancelling residual accelerations through feedback control. The course motion stage tracks the levitated platform in order to keep the levitator's coils centered within their matching magnetic gaps. Aspects of system design, an analysis of the proposed control strategy and simulation results are presented. Feasibility experiments are also discussed.
Author

N92-27788*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
INTERNATIONAL SYMPOSIUM ON MAGNETIC SUSPENSION TECHNOLOGY, PART 2
Nelson J. Groom, ed. and Colin P. Britcher, ed. (Old Dominion Univ., Norfolk, VA.) Washington May 1992 459 p Symposium held in Hampton, VA, 19-23 Aug. 1991
(RTOP 590-14-11-02)
(NASA-CP-3152-Pt-2; L-17092-Pt-2; NAS 1.55:3152-Pt-2) Avail: NTIS HC/MF A20

In order to examine the state of technology of all areas of magnetic suspension and to review related recent developments in sensors and controls approaches, superconducting magnet technology, and design/implementation practices, a symposium was held. The proceedings are presented. The sessions covered the areas of bearings, sensors and controls, microgravity and vibration isolation, superconductivity, manufacturing applications, wind tunnel magnetic suspension systems, magnetically levitated trains (MAGLEV), space applications, and large gap magnetic suspension systems. For individual titles, see N92-27789 through N92-27816.

N92-27789*# Southampton Univ. (England). Inst. of Cryogenics.
MAGNETIC SUSPENSION USING HIGH TEMPERATURE SUPERCONDUCTING CORES **c33**
R. G. Scurlock *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 507-517 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

The development of YBCO high temperature superconductors, in wire and tape forms, is rapidly approaching the point where the bulk transport current density j vs magnetic field H characteristics with liquid nitrogen cooling will enable its use in model cores. On the other hand, BSCCO high temperature superconductor in wire form has poor j-H characteristics at 77 K today, although with liquid helium or hydrogen cooling, it appears to be superior to NbTi superconductor. Since liquid nitrogen cooling is approx. 100 times cheaper than liquid helium cooling, the use of YBCO is very attractive for use in magnetic suspension. The design is discussed of a model core to accommodate lift and drag loads up to 6000 and 3000 N respectively. A comparison is made between the design performance of a liquid helium cooled NbTi (or BSCCO) superconducting core and a liquid nitrogen cooled YBCO superconducting core.
Author

N92-27790*# Mechanical Technology, Inc., Latham, NY.
EFFECT OF FLUX PENETRATION ON THE LOAD CAPACITY OF PASSIVE SUPERCONDUCTING BEARINGS **c33**
Dantam K. Rao *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 519-534 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

A dramatic improvement has been made in the load capacity of a superconductor magnet pair. The measured load capacities that stood at 0.1 psi two years back were improved now to an impressive 40 psi. This improvement is mainly due to better processing techniques developed by the superconducting material processing community. The analysis indicates that, by using these processing techniques that efficiently prevent flux penetration, high load capacities were achieved. With these developments, it is possible to insert passive bearings into actual applications within the next few years.
Author

N92-27791*# Houston Univ., TX. Center for Superconductivity.
APPLICATION OF CERAMIC SUPERCONDUCTORS IN HIGH SPEED TURBINES **c27**
C. K. McMichael, M. A. Lamb, M. W. Lin (California Inst. of Tech., Pasadena.), K. B. Ma, and W. K. Chu *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 535-545 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

A turbine system was modified to adapt melt textured YBa2Cu3O(7-delta) (YBCO) with high energy permanent magnets to form a hybrid superconducting magnetic bearing (HSMB). The HSMB/turbine prototype has achieved a static axial thrust capacity exceeding 41 N/sq cm (60 psi) and a radial magnetic stiffness of 7 N/mm in a field cooled state at 77 K. A comparison was made between different configurations of magnets and superconductor for radial stability, axial instability, and force hystereses. This systematic study lead to a greater understanding of the interactions between YBCO and high energy permanent magnets to define design parameters for high rotational devices using the HSMB design.
Author

N92-27792*# Academy of Sciences (USSR), Moscow. Central Aero-Hydrodynamic Inst.
CRYOGENIC TEST RIG WITH AN AERODYNAMIC MAGNETICALLY LEVITATED CARRIAGE **c09**
Sergey Yu. Borisov, Anton L. Iskra, and Anatoly P. Philatov *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 547-558 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

The results are presented of the studies which concern the use of a magnetically levitated aerodynamic carriage with a model moving in a closed cryogenic channel. The facility dimensions are established, operating ranges are calculated, thermal isolation, cooling and measurement systems are described, comparison of this facility with wind tunnels is given and its advantages are shown.
Author

N92-27793*# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Electrotechnical Developments and Constructions.
THE BEARINGLESS ELECTRICAL MACHINE **c33**
J. Bichsel *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 561-573 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

Electromagnetic bearings allow the suspension of solids. For rotary applications, the most important physical effect is the force of a magnetic circuit to a high permeable armature, called the MAXWELL force. Contrary to the commonly used MAXWELL bearings, the bearingless electrical machine will take advantage of the reaction force of a conductor carrying a current in a magnetic field. This kind of force, called Lorentz force, generates the torque in direct current, asynchronous and synchronous machines. The magnetic field, which already exists in electrical machines and helps to build up the torque, can also be used for the suspension

of the rotor. Besides the normal winding of the stator, a special winding was added, which generates forces for levitation. So a radial bearing, which is integrated directly in the active part of the machine, and the motor use the laminated core simultaneously. The winding was constructed for the levitating forces in a special way so that commercially available standard ac inverters for drives can be used. Besides wholly magnetic suspended machines, there is a wide range of applications for normal drives with ball bearings. Resonances of the rotor, especially critical speeds, can be damped actively. Author

N92-27794*# Forschungszentrum Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Grenzflaechenforschung und Vakuumphysik.
WIDE GAP, PERMANENT MAGNET BIASED MAGNETIC BEARING SYSTEM **c37**
Karl Boden *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 575-594 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

The unique features and applications of the presented electrical permanent magnetic bearing system essentially result from three facts: (1) the only bearing rotor components are nonlaminated ferromagnetic steel collars or cylinders; (2) all radial and axial forces are transmitted via radial gaps; and (3) large radial bearing gaps can be provided with minimum electric power consumption. The large gaps allow for effective encapsulation and shielding of the rotors at elevated or low temperatures, corrosive or ultra clean atmosphere or vacuum or high pressure environment. Two significant applications are described: (1) a magnetically suspended x ray rotary anode was operated under high vacuum conditions at 100 KV anode potential, 600 C temperature at the rotor collars and speed 18000 rpm with 13 mm radial bearing gap; and (2) an improved Czochralski type crystal growth apparatus using the hot wall method for pulling GaAs single crystals of low dislocation density. Both crystal and crucible are carried and transported by magnetically suspended shafts inside a hermetically sealed housing at 800 C shaft and wall temperature. The radial magnetic bearing gap measures 24 mm. Author

N92-27795*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
FORCE ANALYSIS OF MAGNETIC BEARINGS WITH POWER-SAVING CONTROLS **c37**
Dexter Johnson, Gerald V. Brown, and Daniel J. Inman (State Univ. of New York, Buffalo.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 595-613 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

Most magnetic bearing control schemes use a bias current with a superimposed control current to linearize the relationship between the control current and the force it delivers. For most operating conditions, the existence of the bias current requires more power than alternative methods that do not use conventional bias. Two such methods are examined which diminish or eliminate bias current. In the typical bias control scheme it is found that for a harmonic control force command into a voltage limited transconductance amplifier, the desired force output is obtained only up to certain combinations of force amplitude and frequency. Above these values, the force amplitude is reduced and a phase lag occurs. The power saving alternative control schemes typically exhibit such deficiencies at even lower command frequencies and amplitudes. To assess the severity of these effects, a time history analysis of the force output is performed for the bias method and the alternative methods. Results of the analysis show that the alternative approaches may be viable. The various control methods examined were mathematically modeled using nondimensionalized variables to facilitate comparison of the various methods. Author

N92-27796*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Guidance and Control Section.
MANIPULATION AND IDENTIFICATION OF OBJECTS BY MAGNETIC FORCES **c37**
Benjamin Joffe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 617-638 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

An overview is presented of the results of research and engineering design activities over the past 20 years in the area of identification and manipulation of objects by magnetic forces. The relationship is discussed between the properties of objects and the parameters of magnetic fields, with the view toward being able to create forces for efficient manipulation and identification of different kinds of parts. Some of this information, particularly regarding nonferromagnetic materials, is relatively new and can be used to solve a variety of engineering problems by creating new types of automation systems. Topics covered include identification and orientation of bodies by magnetostatic and electrodynamic forces, electromagnetic recognition and orientation of nonsymmetric parts, and assembly and position control of parts by electromagnetic forces. Author

N92-27797*# IBM Research Lab., Yorktown Heights, NY.
PRECISE POSITIONING AND COMPLIANCE SYNTHESIS FOR AUTOMATIC ASSEMBLY USING LORENTZ LEVITATION **c37**
R. L. Hollis and S. Salcudean (British Columbia Univ., Vancouver.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 639-654 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

Many manufacturing assembly tasks require fine compliant motion and fast, accurate positioning. Conventional robots perform poorly in these tasks because of their large mass, friction and backlash in gears, cogging in drive motors and other deleterious effects. Even robots equipped with special control systems enabling compliant operation offer only partial solutions. It is difficult or impossible to automate many product assemblies requiring fine, compliant motion. This problem can be greatly alleviated by dividing the manipulation system into coarse and fine domains. In this scenario, a standard industrial robot can serve as a coarse positioner which in turn carries a six degrees of freedom fine motion wrist. Thus the robot can access a workspace measured in meters at low bandwidth and low resolution while the wrist can move over millimeters at high bandwidth and high resolution during the final phase of the assembly operation. Work indicates that fine motion wrists using Lorentz levitation can greatly augment the accuracy and dexterity of robots because they are frictionless, have high bandwidths and have a single back drivable moving part. Also, since there is no contact between the moving and stationary parts, wear and contamination can be eliminated. The use of six Lorentz force actuators in combination with real time position and orientation sensing offers several important advantages over magnetic bearing approaches. Author

N92-27798*# Fare, Inc., College Park, MD.
DEVELOPMENT OF A DIFFERENTIALLY BALANCED MAGNETIC BEARING AND CONTROL SYSTEM FOR USE WITH A FLYWHEEL ENERGY STORAGE SYSTEM **c44**
Mark A. Higgins, David P. Plant, Douglas M. Ries, James A. Kirk, and Davinder K. Anand (Maryland Univ., College Park.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 657-672 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

The purpose of a magnetically suspended flywheel energy storage system for electric utility load leveling is to provide a means to store energy during times when energy is inexpensive to produce and then return it to the customer during times of peak power demand when generated energy is most expensive. The design of a 20 kWh flywheel energy storage system for electric utility load leveling applications involves the successful integration

of a number of advanced technologies so as to minimize the size and cost of the system without affecting its efficiency and reliability. The flywheel energy storage system uses a carbon epoxy flywheel, two specially designed low loss magnetic bearings, a high efficiency motor generator, and a 60 cycle AC power converter all integrated through a microprocessor controller. The basic design is discussed of each of the components that is used in the energy storage design. Author

N92-27799*# Virginia Univ., Charlottesville. Center for Magnetic Bearings.

DESIGN OF BEARINGS FOR ROTOR SYSTEMS BASED ON STABILITY c37

D. Dhar, L. E. Barrett, and C. R. Knospe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 673-690 (For primary document see N92-27788 18-18)

Avail: NTIS HC/MF A20

Design of rotor systems incorporating stable behavior is of great importance to manufacturers of high speed centrifugal machinery since destabilizing mechanisms (from bearings, seals, aerodynamic cross coupling, noncolocation effects from magnetic bearings, etc.) increase with machine efficiency and power density. A new method of designing bearing parameters (stiffness and damping coefficients or coefficients of the controller transfer function) is proposed, based on a numerical search in the parameter space. The feedback control law is based on a decentralized low order controller structure, and the various design requirements are specified as constraints in the specification and parameter spaces. An algorithm is proposed for solving the problem as a sequence of constrained 'minimax' problems, with more and more eigenvalues into an acceptable region in the complex plane. The algorithm uses the method of feasible directions to solve the nonlinear constrained minimization problem at each stage. This methodology emphasizes the designer's interaction with the algorithm to generate acceptable designs by relaxing various constraints and changing initial guesses interactively. A design oriented user interface is proposed to facilitate the interaction. Author

N92-27800*# Bath Univ. (England). School of Mechanical Engineering.

AN EVALUATION OF SOME STRATEGIES FOR VIBRATION CONTROL OF FLEXIBLE ROTORS c39

C. R. Burrows *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 691-705 (For primary document see N92-27788 18-18)

Avail: NTIS HC/MF A20

There is evidence that the reliability of magnetic bearings has achieved an acceptable level in applications when high cost can be tolerated. This acceptability would be enhanced if the inherent capability of magnetic bearings as active control elements were fully used. The technological and commercial promise of magnetic bearings will be fulfilled only if attention is focussed on the control problems associated with their use. The open loop adaptive control algorithm provides an efficient method of controlling the vibration of rotors without the need of a prior knowledge of parameter values. It overcomes the disadvantages normally associated with open loop control while avoiding the problem of instability associated with closed loop control algorithms. The algorithm is conceptually satisfying because it uses the capability of magnetic bearings as fully active vibration control elements rather than limiting them to act as adjustable stiffness and damping elements, as is the case when they are used with local position and velocity feedback. Author

N92-27801*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

PROPULSION SIMULATOR FOR MAGNETICALLY SUSPENDED WIND TUNNEL MODELS c09

P. B. Joshi, M. R. Malonson, G. P. Sacco, C. L. Goldey, K. Garbutt, M. Goodyer (Southampton Univ., England), and P. Lawing *In its* International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 709-739 (For primary document see N92-27788 18-18)

(Contract NAS1-18845)

Avail: NTIS HC/MF A20

Simulation of propulsion induced aerodynamic forces and moments, which arise as a result of interactions between propulsive jets and the free stream, is one of the most desired capabilities in magnetic suspension wind tunnels. The feasibility of generating exhaust jets of appropriate characteristics onboard magnetically suspended models was examined. Four concepts of remotely operated propulsion simulators was considered. Three conceptual designs involving conventional technologies such as compressed gas cylinders, liquid monopropellants, and solid propellants were developed. The fourth concept, a laser assisted thruster, which can potentially simulate both inlet and exhaust flows, was found to require very high power levels. The measurement of aerodynamic forces and/or moments were demonstrated, including the effects of exhaust jets, in MSBS wind tunnels. Two propulsion simulator models were developed, a small scale and a large scale unit, both using compressed, liquified CO2 as propellant. Results of the wind tunnel tests with the small scale simulator are discussed. Author

N92-27802*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

PRESENT STATUS OF THE MIT/NASA LANGLEY 6-INCH MSBS c09

Timothy Schott, Thomas Jordan, Taumi Daniels, and Charles Alcorn (Old Dominion Univ., Norfolk, VA.) *In its* International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 741-764 (For primary document see N92-27788 18-18)

Avail: NTIS HC/MF A20

The latest improvements are described which were made to the MIT/NASA Langley 6 Inch Magnetic Suspension and Balance System and its operational capabilities. Since its relocation from MIT in 1984, the system has suffered from reliability problems with original equipment. System performance is ultimately limited by noise and antiquated power supplies. Although a limited amount of funding and man hours has been expended, some significant improvements were made to the system. The design and implementation of a new electro-magnetic position sensor has significantly reduced system noise and drift. The system was shown fully operational for the first time since its arrival at NASA Langley. An ogive cylinder test model was suspended while running the wind tunnel at its maximum of approx. Mach 0.5. Other aerodynamic models were suspended with wind on. Also, the simulation of low speed cavity store separation using an ogive cylinder test model is described. Methods used for flow visualization for this test are also discussed. The system is ideally suited for this type of low speed testing. Author

N92-27803*# Moscow Inst. of Aviation Technology (USSR).

PROGRESS OF MAGNETIC SUSPENSION AND BALANCE SYSTEMS FOR WIND TUNNELS IN THE USSR c09

A. V. Kuzin, Y. D. Vyshkov, and G. K. Shapovalov (Academy of Sciences, USSR, Moscow) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 765-774 (For primary document see N92-27788 18-18)

Avail: NTIS HC/MF A20

Magnetic Suspension and Balance Systems (MSBS) for wind tunnels are being developed in order to solve the principal problems of aerodynamics which cannot be solved by conventional means: (1) measurements of aerodynamic loads acting on the aircraft models without the effects of mechanical supporting devices; and (2) the study of base pressure. This paper traces the progress of MSBS for wind tunnels in the Commonwealth of Independent States (CIS). The paper describes electromagnetic configuration, position sensing, and control and calibration systems of two wind tunnel MSBS existing in the CIS. The features of high-angle-of-attack control and roll control are discussed. The results of preliminary

experiments on high-angle-of-attack and roll controls, digital control, and aerodynamic testing are also presented. Author

N92-27804*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
WIND TUNNEL MAGNETIC SUSPENSION SYSTEMS AT THE UNIVERSITY OF SOUTHAMPTON, ENGLAND **c09**
Michael J. Goodyer *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 775-788 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

The magnetic suspension system at Southampton University was used in two roles: as a device for producing useful aerodynamic data, and as a vehicle to develop and demonstrate new technology for application to a projected larger facility. Examples of both follow, beginning with an outline of the quest to develop methods for reaching high angles of attack because of current interest in researching the associated aerodynamics. Author

N92-27805*# Foster-Miller Associates, Inc., Waltham, MA.
ATTRACTIVE AND REPULSIVE MAGNETIC SUSPENSION SYSTEMS OVERVIEW **c37**
David B. Cope and Richard R. Fontana *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 791-812 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

Magnetic suspension systems can be used in a wide variety of applications. The decision of whether to use an attractive or repulsive suspension system for a particular application is a fundamental one which must be made during the design process. As an aid to the designer, we compare and contrast attractive and repulsive magnetic suspension systems and indicate whether and under what conditions one or the other system is preferred. Author

N92-27806*# Railway Technical Research Inst., Tokyo (Japan).
CHANGE IN THE COIL DISTRIBUTION OF ELECTRODYNAMIC SUSPENSION SYSTEM **c33**
Hisashi Tanaka *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 813-825 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

At the Miyazaki Maglev Test Center, the initial test runs were completed using a system design that required the superconducting coils to be parallel with the ground levitation coils. Recently, the coil distribution was changed to a system such that the two types of coils were perpendicular to each other. Further system changes will lead to the construction of a side wall levitation system. It is hoped that the development will culminate in a system whereby a superconducting coil will maintain all the functions: levitation, propulsion, and guidance. D.R.D.

N92-27807*# TG and C Associates, Inc., Falmouth, VA.
THE CONCEPT OF THE MECHANICALLY ACTIVE GUIDEWAY AS A NOVEL APPROACH TO MAGLEV **c37**
T. G. Horwath *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 827-843 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

A maglev system that is suitable for operation in the United States will have to meet unique requirements which determine the major systems characteristics. Maglev configurations presently developed in Germany and Japan are based on conventional maglev concepts and as such do not meet all of the requirements. A novel maglev guideway concept is introduced as a solution. This concept, the mechanically active guideway, is articulated in three degrees of freedom and assumes system functions which normally reside in the maglev vehicle. The mechanically active guideway contains spatially distributed actuators which are energized under computer control at the time of vehicle passage to achieve bank angle adjustment and ride quality control. A typical realization of the concept is outlined. Author

N92-27808*# SRI International Corp., Menlo Park, CA. Information, Telecommunications, and Automation Div.
SPACE APPLICATIONS OF DIAMAGNETIC SUSPENSIONS **c37**
Ronald E. Pelrine *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 847-856 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

Conventional noncontact magnetic suspensions require power and sensor feedback to maintain stability of the levitated object. Magnetic suspensions using superconductors require neither power nor feedback for stability but must be maintained at low temperatures. This paper discusses a little known type of magnetic bearing that does not require power, sensor feedback, or cooling: diamagnetic suspension. While the bearing pressure for diamagnetic suspensions is typically limited to 1 g/sq cm, their simplicity, environmental tolerances, and wide range of material choices suggest that they may be useful for a number of space applications. This paper discusses the fundamentals of diamagnetic suspensions as well as their potential space applications. Author

N92-27809*# Aerospatiale, Les Mureaux (France).
MAGNETIC BEARING WHEELS FOR VERY HIGH POINTING ACCURACY SATELLITE MISSIONS **c37**
J. P. Roland *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 857-872 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

Inertia wheels used as actuators in Attitude Control Systems remain the most frequently encountered solution for all types of scientific or military space missions. The magnetic levitation of the flywheel leads to increased performance, which will be necessary for the high pointing accuracy missions in the next decade. For military and commercial earth observation missions, for optical link telecommunication missions, as well as for metallurgical process missions under microgravity conditions, the need for platform stability will become stronger and stronger. Work in progress on the Magnetic Bearing Reaction Wheel, dedicated to the HELIOS military earth observation satellite, is presented. The HELIOS program is very demanding in terms of pointing accuracy. The main features of this wheel and its overall characteristics are given. Author

N92-27810*# SatCon Technology Corp., Cambridge, MA.
AN ELECTROSTATICALLY SUSPENDED, MICRO-MECHANICAL RATE GYROSCOPE **c35**
Timothy Hawkey and Richard Torti *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 873-892 (For primary document see N92-27788 18-18)
(Contract NAS1-19282)
Avail: NTIS HC/MF A20

SatCon Technology has performed a study of micromechanical gyroscopes. The goals of this program were to define a baseline system configuration and establish technical feasibility for proof of principle and prototype fabrication. This report documents the research and presents the baseline mechanical design, sensors, control systems, and electronics. This section presents a project overview and specific technical objectives. Section 2 contains a background on micromechanical technology. Section 3 contains the microgyroscope specifications and configurations. Section 4 contains the electromechanical design. Section 5 outlines the control and electronics. Section 6 presents a preliminary sequence for microfabrication of the baseline design, and Section 7 contains conclusions and recommendations for further work. Author

N92-27811*# Boeing Aerospace Co., Seattle, WA. Aerospace and Electronics.
BATTERY CARS ON SUPERCONDUCTING MAGNETICALLY LEVITATED CARRIERS: ONE COMMUTING SOLUTION c33
B. Mike Briggs and Henry Oman *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 895-906 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

Commuting to work in an urban-suburban metropolitan environment is becoming an unpleasant time-wasting process. We applied the technology of communication management to this commuting problem. Communication management is a system-engineering tool that produced today's efficient telephone network. The resulting best commuting option is magnetically levitated carriers of two-passenger, battery-powered, personally-owned local-travel cars. A commuter drives a car to a nearby station, selects a destination, drives on a waiting carrier, and enters an accelerating ramp. A central computer selects an optimum 100 miles-per-hour trunk route, considering existing and forecast traffic; assigns the commuter a travel slot, and subsequently orders switching-station actions. The commuter uses the expensive facilities for only a few minutes during each trip. The cost of travel could be less than 6 cents per mile. Author

N92-27812*# Knolle Magnetrans, San Francisco, CA.
KNOLLE MAGNETRANS: A MAGNETICALLY LEVITATED TRAIN SYSTEM c37
Ernst G. Knolle *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 907-918 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

The Knolle Magnetrans is a continuous transportation system featuring small cars traveling in rapid succession, levitated by permanent magnets in repulsion, and propelled by stationary linear induction motors. The vehicles' headway, speed, acceleration, and deceleration are designed into the system and mechanically enforced. Passengers board dynamically and controls consist of a simple on-off relay. This paper summarizes the system design goals, describes the system components and discusses related environmental issues. Author

N92-27813*# Argonne National Lab., IL. Energy Systems Div.
COMPUTATION OF MAGNETIC SUSPENSION OF MAGLEV SYSTEMS USING DYNAMIC CIRCUIT THEORY c33
J. L. He, D. M. Rote, and H. T. Coffey *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 919-938 Previously announced as N92-12280 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

Dynamic circuit theory is applied to several magnetic suspensions associated with maglev systems. These suspension systems are the loop-shaped coil guideway, the figure-eight-shaped null-flux coil guideway, and the continuous sheet guideway. Mathematical models, which can be used for the development of computer codes, are provided for each of these suspension systems. The differences and similarities of the models in using dynamic circuit theory are discussed in the paper. The paper emphasizes the transient and dynamic analysis and computer simulation of maglev systems. In general, the method discussed here can be applied to many electrodynamic suspension system design concepts. It is also suited for the computation of the performance of maglev propulsion systems. Numerical examples are presented in the paper. Author

N92-27814*# British Columbia Univ., Vancouver. Dept. of Physics.
LARGE-GAP MAGNETIC POSITIONING SYSTEM HAVING ADVANTAGEOUS CONFIGURATION c37
Paul Chong, Colin Commandeur, Harold Davis, and Lorne Whitehead *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 941-953 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

A magnetic configuration was devised in which the positioned object is maintained in a stable orientation and position on one side of an opaque plane surface entirely by means of magnetic components on the other side of the plane. The system is effective with or without gravity, and can operate in any orientation. In this system, the positioned object need only contain a simple dipole magnet. The positioning components consist of a group of permanent magnets creating a magnetic field configuration which stabilizes the levitated dipole in all but one degree of freedom, and a magnetic position sensing and force feedback system to actively stabilize the object in the one unstable direction. The system utilizes very low power at equilibrium and can maintain gaps of 50 mm. Author

N92-27815*# SatCon Technology Corp., Cambridge, MA.
PERFORMANCE OF A SUPERCONDUCTING LARGE-ANGLE MAGNETIC SUSPENSION c37
James R. Downer, Dariusz A. Bushko, Vijay Gondhalekar, and Richard P. Torti *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 955-970 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

SatCon Technology Corporation is working toward the development of an advanced-concept Control Moment Gyro (CMG). The advanced-concept CMG is sized for use as a slewing actuator for large space-based payloads. The design features a magnetically suspended composite rotor which contains a persistent-mode superconducting solenoid magnet. The rotor is suspended and gimballed by the interaction of the fields produced by the superconductor and an array of cryoresistive coils. The rotor spins in a liquid helium environment, while the control coils are liquid-hydrogen cooled. This design is capable of meeting the requirements of many high-performance slewing applications (27,000 Nm). The use of the magnetic suspension as rotor bearings, gimbal bearings, and gimbal torquers also substantially reduces the mass of the CMG system. Author

N92-27816*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE LARGE-ANGLE MAGNETIC SUSPENSION TEST FIXTURE c37
Colin P. Britcher, Mehran Ghofrani, Thomas C. Britton (Lockheed Engineering and Sciences Co., Hampton, VA.), and Nelson J. Groom *In its* International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 971-999 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

As part of a NASA effort to develop the technology and techniques required to demonstrate the magnetic suspension of objects over wide ranges of attitudes, a small-scale demonstration project was undertaken. The objectives here are to suspend a cylindrical element containing a permanent magnet core, to demonstrate stability and control in five degrees-of-freedom, and to permit controlled rotation of the model in one degree-of-freedom over the full range of 360 deg. Further constraints are that all suspension and control electromagnets are to be behind a flat plane, located some distance from the model. Since this is a ground-based experiment and in order to maintain generality, the plane is chosen to be horizontal with the model levitated above the plane by repulsive forces. Author

N92-27862# American Inst. of Biological Sciences, Washington, DC.
CONFERENCE ON COMBINED EFFECTS: RADIATION, MICROG RAVITY, TRAUMA, AND OTHER FACTORS Final Report, 1 Jun. 1990 - 31 May 1991
Donald R. Beem 31 May 1992 2 p Conference held in The

Hague, Netherlands, 25 Jun. - 7 Jul. 1990
(Grant AF-AFOSR-0236-90)
(AD-A247799; AFOSR-92-0072TR) Avail: NTIS HC/MF A01

The Section Conference was a success and the information presented by the speakers was acknowledged by the attendees. COSPAR was established to continue the cooperative programs of rocket and satellite research successfully undertaken during the International Geophysical Year of 1957-58. The ISCU resolution creating COSPAR stated that the primary purpose of COSPAR was to provide the world scientific community with the means whereby it may exploit the possibilities of satellites and space probes of all kinds for scientific purposes, and exchange and resulting data on a cooperative basis. The objective of the AFOSR supported AIBS project was to provide for travel and subsistence support for a limited number of US speakers to attend Section MF.4 Combined Effect: Radiation, Microgravity, Trauma and Other Factors at the XXVIIIth meeting of COSPAR held at The Hague, The Netherlands, 25 June - 7 July 1990. GRA

N92-28213*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
USER ASSEMBLY AND SERVICING SYSTEM FOR SPACE STATION, AN EVOLVING ARCHITECTURE APPROACH Final Report
Thomas A. LaVigna and Helmut P. Cline 27 Apr. 1988 11 p
(NASA-TM-107942; NAS 1.15:107942) Avail: NTIS HC/MF A03

On-orbit assembly and servicing of a variety of scientific and applications hardware systems is expected to be one of the Space Station's primary functions. The hardware to be serviced will include the attached payloads resident on the Space Station, the free-flying satellites and co-orbiting platforms brought to the Space Station, and the polar orbiting platforms. The requirements for assembly and servicing such a broad spectrum of missions have led to the development of an Assembly and Servicing System Architecture that is composed of a complex array of support elements. This array is comprised of US elements, both Space Station and non-Space Station, and elements provided by Canada to the Space Station Program. For any given servicing or assembly mission, the necessary support elements will be employed in an integrated manner to satisfy the mission-specific needs. The structure of the User Assembly and Servicing System Architecture and the manner in which it will evolved throughout the duration of the phased Space Station Program are discussed. Particular emphasis will be placed upon the requirements to be accommodated in each phase, and the development of a logical progression of capabilities to meet these requirements. Author

N92-27219*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ATTITUDE STABILITY OF LDEF: REFINEMENT OF RESULTS FROM THE SILVER PINHOLE CAMERA Abstract Only
P. N. Peters and J. C. Gregory (Alabama Univ., Huntsville.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 3 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27220*# Boeing Co., Seattle, WA. Defense and Space Group.
LDEF MICROENVIRONMENTS, OBSERVED AND PREDICTED Abstract Only
R. J. Bourassa *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 4 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27325*# American Space Technology, Inc., Santa Monica, CA.
RETRIEVABLE PAYLOAD CARRIER. NEXT GENERATION LONG DURATION EXPOSURE FACILITY: UPDATE 1992 Abstract Only
A. T. Perry, J. A. Cagle, and S. C. Newman *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 126 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27932# Joint Publications Research Service, Arlington, VA.
GAMMA ASTRONOMY SATELLITE
P. N. Polezhayev and V. P. Poluektov *In its* JPRS Report: Science and Technology. Central Eurasia: Space 27 Jan. 1992 p 2-8 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 3, May - Jun. 1991 p 2-9 (For primary document see N92-27931 18-12)
Avail: NTIS HC/MF A05

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxilliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion,* and *15 Launch Vehicles and Space Vehicles.*

N92-27198# Naval Postgraduate School, Monterey, CA.
DESIGN AND TESTING OF A CASELESS SOLID-FUEL INTEGRAL-ROCKET RAMJET ENGINE FOR USE IN SMALL TACTICAL MISSILES M.S. Thesis
Keith J. Fruge Sep. 1991 60 p
(AD-A246226) Avail: NTIS HC/MF A04

An investigation was conducted to determine the feasibility of a low cost, caseless, solid fuel integral rocket ramjet (IRSFRJ) that has no ejecta. Analytical design of a ramjet powered air-to-ground missile capable of being fired from a remotely piloted vehicle or helicopter was accomplished using current JANNAF and Air Force computer codes. The results showed that an IRSFRJ powered missile can exceed the velocity and range of current systems by more than a two to one ratio, without an increase in missile length and weight. A caseless IRSFRJ with a nonejecting port cover was designed and tested. The experimental results of the static tests showed that a low cost, caseless IRSFRJ with a nonejectable port cover is a viable design. Rocket ramjet transition was demonstrated and ramjet ignition was found to be insensitive to the booster tail off to air injection timing sequence. GRA

N92-27403*# Engineering Research and Consulting, Inc., Tullahoma, TN.
AUTOMATED SCREENING OF PROPULSION SYSTEM TEST DATA BY NEURAL NETWORKS, PHASE 1 Final Report, 4 Oct. 1991 - 3 Apr. 1992
W. Andes Hoyt and Bruce A. Whitehead (Tennessee Univ. Space Inst., Tullahoma.) 17 Apr. 1992 48 p
(Contracts NAS8-39184; SBA-4-91-2-0357)
(NASA-CR-184329; NAS 1.26:184329; ERC-R-92-022) Avail: NTIS HC/MF A03

The evaluation of propulsion system test and flight performance data involves reviewing an extremely large volume of sensor data generated by each test. An automated system that screens large volumes of data and identifies propulsion system parameters which appear unusual or anomalous will increase the productivity of data analysis. Data analysts may then focus on a smaller subset of anomalous data for further evaluation of propulsion system tests.

Such an automated data screening system would give NASA the benefit of a reduction in the manpower and time required to complete a propulsion system data evaluation. A phase 1 effort to develop a prototype data screening system is reported. Neural networks will detect anomalies based on nominal propulsion system data only. It appears that a reasonable goal for an operational system would be to screen out 95 pct. of the nominal data, leaving less than 5 pct. needing further analysis by human experts.

Author

N92-27430# National Aerospace Lab., Kakuda (Japan). Research Center.

STRUCTURAL ANALYSIS OF THERMAL FATIGUE FAILURES ON ROCKET COMBUSTION CHAMBERS BY THE FINITE ELEMENT METHOD

Tomoyuki Hashimoto Jul. 1991 23 p In JAPANESE; ENGLISH summary

(NAL-TR-1117; ISSN-0389-4010; JTN-92-80384) Avail: NTIS HC/MF A03

Accurately estimating the thermal stress and strain levels in rocket combustion chambers is an important factor for increasing their safety and reliability. At the NAL, two thermal fatigue failures have occurred in water cooled combustion chambers. This paper examines the cause of the failures and chamber deformations using an inelastic structural analysis incorporating the Finite Element Method (FEM). Both the analytical crack initiation life at low cycle fatigue conditions and analytical deformation determined using a crack initiation model agreed with observed results obtained by a Scanning Electron Microscope (SEM) and with the eye. Another analysis indicates that modifying the cooling channel design would increase the crack initiation life. It was also shown that FEM structural analysis is an effective method for estimating thermal stress and strain levels in rocket combustion chambers.

Author (NASDA)

N92-27521# Naval Postgraduate School, Monterey, CA.

MULTIPLE-WAVELENGTH TRANSMISSION MEASUREMENTS IN ROCKET MOTOR PLUMES M.S. Thesis

Hong-On Kim Sep. 1991 63 p

(AD-A245999) Avail: NTIS HC/MF A04

Multiple-wavelength light transmission measurements were used to measure the mean particle size (d(sub 32)), index of refraction (m), and standard deviation of the small particles in the edge of the plume of a small solid propellant rocket motor. The results have shown that the multiple-wavelength light transmission measurement technique can be used to obtain these variables. The technique was shown to be more sensitive to changes in d(sub 32) and standard deviation (sigma) than to m. A GAP/AP/4.7 percent aluminum propellant burned at 25 atm produced particles with d32 = 0.150 +/- 0.006 microns, standard deviation = 1.50 +/- 0.04 and m = 1.63 +/- 0.13. The good correlation of the data indicated that only submicron particles were present in the edge of the plume. In today's budget conscious industry, the solid propellant rocket motor is an ideal propulsion system due to its low cost and simplicity. The major obstacle for solid rocket motors, however, is their limited specific impulse compared to airbreathing motors. One way to help overcome this limitation is to utilize metal fuel additives. Solid propellant rocket motors can achieve high specific impulse with metal fuel additives such as aluminum. Aluminum propellants also increase propellant densities and suppress transverse modes of combustion oscillations by damping the oscillations with the aluminum agglomerates in the combustion chamber.

GRA

N92-27627 Department of the Navy, Washington, DC.

ROCKET NOZZLE SNUBBER Patent

Jeffrey P. Hoever, inventor (to Navy), Richard L. Reginato, inventor (to Navy), Frederick M. Bay, inventor (to Navy), Claudia E. Rolon, inventor (to Navy), and Michael Bazigos, inventor (to Navy) 29 Oct. 1991 6 p Filed 19 Feb. 1991

(AD-D015239; US-Patent-5,060,550; US-Patent-Appl-SN-658163; US-Patent-Class-89-1.809) Avail: US Patent and Trademark Office

Stress from the ignition of a rocket is transferred from the rocket nozzle to the actuators and flexible joint seal which move the nozzle causing potential failure of the actuators. This stress can be relieved by using a snubber in the form of a flexible hollow conical toroidal bladder filled with incompressible fluid fitted snugly between the nozzle and the main body of the rocket. Such a snubber transfers the stress to the main body of the rocket through the snubber while deforming to allow the rocket nozzle to slew in response to control commands.

GRA

N92-27654*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

PROPULSION SYSTEMS USING IN SITU PROPELLANTS FOR A MARS ASCENT VEHICLE

Mary F. Wadel and Elizabeth A. Roncace Jul. 1992 12 p Proposed for presentation at the 28th Joint Propulsion Conference and Exhibit, Nashville, TN, 6-8 Jul. 1992; sponsored by AIAA, SAE, ASME, and ASEE

(RTOP 506-42-72)

(NASA-TM-105741; E-7146; NAS 1.15:105741; AIAA-92-3445) Copyright Avail: NTIS HC/MF A03

The indigenous propellants of oxygen and carbon monoxide were studied for use in a Mars Ascent Vehicle (MAV). Both the oxygen and carbon monoxide were evaluated as turbine working fluids for a full expander engine cycle used in the MAV. Two oxygen working fluid engines and four carbon monoxide engines were investigated. The maximum hot-gas-side wall temperature was limited to either 445 K (800 R) or 556 K (1000 R) over a range of working fluid mass flows. An engine thrust of 44.5 kN (1,000 lb(sub f)) was assumed. The engine characteristics of coolant inlet pressure, total engine length, specific impulse, pump efficiencies, and turbine power required were optimized. Of the six engines evaluated, the study showed that either type of working fluid was feasible for a MAV engine. Using carbon monoxide as the working fluid resulted in the best engine characteristics.

Author

N92-27878*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

VALIDATION TEST OF ADVANCED TECHNOLOGY FOR IPV NICKEL-HYDROGEN FLIGHT CELLS: UPDATE

John J. Smithrick and Stephen W. Hall (Naval Weapons Support Center, Crane, IN.) 1992 13 p Presented at the 27th Intersociety Energy Conversion Engineering Conference; sponsored by SAE, ACS, AIAA, ASME, IEEE, AIChE, and ANS

(RTOP 506-41-21)

(NASA-TM-105689; E-7069; NAS 1.15:105689) Avail: NTIS HC/MF A03

Individual pressure vessel (IPV) nickel-hydrogen technology was advanced at NASA Lewis and under Lewis contracts with the intention of improving cycle life and performance. One advancement was to use 26 percent potassium hydroxide (KOH) electrolyte to improve cycle life. Another advancement was to modify the state-of-the-art cell design to eliminate identified failure modes. The modified design is referred to as the advanced design. A breakthrough in the low-earth-orbit (LEO) cycle life of IPV nickel-hydrogen cells has been previously reported. The cycle life of boiler plate cells containing 26 percent KOH electrolyte was about 40,000 LEO cycles compared to 3,500 cycles for cells containing 31 percent KOH. The boiler plate test results are in the process of being validated using flight hardware and real time LEO testing at the Naval Weapons Support Center (NWSC), Crane, Indiana under a NASA Lewis Contract. An advanced 125 Ah IPV nickel-hydrogen cell was designed. The primary function of the advanced cell is to store and deliver energy for long-term, LEO spacecraft missions. The new features of this design are: (1) use of 26 percent rather than 31 percent KOH electrolyte; (2) use of a patented catalyzed wall wick; (3) use of serrated-edge separators to facilitate gaseous oxygen and hydrogen flow within the cell, while still maintaining physical contact with the wall wick for electrolyte management; and (4) use of a floating rather than a fixed stack (state-of-the-art) to accommodate nickel electrode expansion due to charge/discharge cycling. The significant

improvements resulting from these innovations are: extended cycle life; enhanced thermal, electrolyte, and oxygen management; and accommodation of nickel electrode expansion. The advanced cell design is in the process of being validated using real time LEO cycle life testing of NWSC, Crane, Indiana. An update of validation test results confirming this technology is presented. Author

N92-27933# Joint Publications Research Service, Arlington, VA.
ORBITAL SOLAR ELECTRIC POWER STATIONS
Ye. A. Narimanov and I. G. Virko, ed. *In its* JPRS Report: Science and Technology. Central Eurasia: Space 27 Jan. 1992 p 19-31 Transl. into ENGLISH from Novoye v Zhizni, Nauke, Tekhnike: Seriya Kosmonavtika, Astronomiya (Moscow, USSR), no. 3, Mar. 1991 p 1-38 (For primary document see N92-27931 18-12)
Avail: NTIS HC/MF A05

23 CHEMISTRY AND MATERIALS (GENERAL)

N92-27269*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LDEF MATERIALS OVERVIEW Abstract Only
Bland A. Stein *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 63 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

24 COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.
For ceramic materials see *27 Nonmetallic Materials.*

N92-27383# Naval Air Development Center, Warminster, PA. Air Vehicle and Crew Systems Technology Dept.
CHARACTERIZATION OF POWDER COATED THERMOPLASTIC COMPOSITE Final Report, Sep. 1988 - Sep. 1990
Roland Cochran 22 Jul. 1991 42 p
(AD-A247230; NADC-91062-60) Avail: NTIS HC/MF A03

Thermoplastic powder resin preforms are a relatively new form of composite preform material. Powder preforms offer improved handelability as well as the possibility to produce composites from resins that are difficult to prepreg. The purpose of this project was to characterize thermoplastic powder coated material. A polyetheretherketone (PEEK) resin coated material supplied by BASF was studied. The physical properties of the preform were characterized through electron microscopy and thermal analysis. Electron microscopy was used to determine the size and distribution of the powder particles along with the amount of binder in the preform. Thermal analysis DSC and TGA were used to determine the melting point and the amount of binder in the preform. In addition, the resin content was measured using acid digestion. The resulting understanding of the material properties will provide a basis for developing process models and implementing this material in a production process. GRA

N92-27531# Wright Lab., Wright-Patterson AFB, OH.
THE EFFECT OF JET FUEL EXPOSURE ON ADVANCED AEROSPACE COMPOSITES. PART 1: THERMAL AND CHEMICAL ANALYSIS Final Technical Report, May 1989 - May 1990
David B. Curliss Dec. 1991 36 p
(AD-A246559; WL-TR-91-4017) Avail: NTIS HC/MF A03

The sensitivity of several aerospace composite materials to military jet engine fuel, JP-4, was investigated in this study. The effect of fuel on the physical and mechanical properties was evaluated. The absorption rates of JP-4 into the composites and the effects of JP-4 exposure on the mechanical properties of the composites were given in WRDC-TR-90-4064. Thermal analysis of the composite materials including TMA and DSC was performed and is reported here. During exposure to JP-4, the only composite materials that absorbed an appreciable amount of fuel were the APC-2 (+/- 45)2S and HTA (+/- 45)2S coupons. Chemical species desorbed from these composite specimens using a vacuum desorption apparatus developed in-house were analyzed using GC-MS and the results are reported here. As expected, HTA and APC-2 coupons tested at elevated temperatures after exposure to JP-4 had lower levels of the more volatile components of JP-4 than did the HTA and APC-2 coupons exposed to JP-4 and tested at room temperature. The more volatile components are more mobile and more likely to desorb from the polymer at elevated temperatures. APC-2 was found to have significant quantities of Phenol present. This is attributed to the slightly polar character of the poly-(aryl ether ether ketone) (PEEK) matrix thermoplastic of APC-2. GRA

N92-27614# National Research Council of Canada, Ottawa (Ontario). Industrial Materials Inst.
IMI: IN PARTNERSHIP WITH INDUSTRY [L'IMI: PARTENAIRE DE L'INDUSTRIE]
1992 21 p In FRENCH Original contains color illustrations Back matter as supplement
(CTN-92-60490) Avail: NTIS HC/MF A03

The Industrial Materials Institute was founded in 1978 to promote the growth and competitiveness of the Canadian materials industry. The Institute's specialty is materials forming and a series of research programs is studying metals, ceramics, alloys, and composites in cooperation with the aeronautics, steel, mining, automotive, transportation, telecommunications, and other industries. The Institute is organized into four main sections: Computer Integrated Materials Processing, which develops software and systems that predict material behavior under manufacturing conditions; Metals and Ceramics, and Industrial Polymers, which confine their research to specific materials and the development of new forming techniques; and the Instrumentation and Sensors section, which develops instruments to control the quality of materials and manufacturing processes. The capabilities of these sections are described, along with services of the Institute available to industry. Some accomplishments of the Institute are reviewed in such areas as nondestructive evaluation, moulding processes, welding automation, strip casting, high-temperature superconductors, and coatings. CISTI

N92-27650# National Research Council of Canada, Boucherville (Quebec). Industrial Materials Inst.
INDUSTRIAL MATERIALS INSTITUTE Annual Report, 1990-1991 [INSTITUT DES MATERIAUX INDUSTRIELS, RAPPORT ANNUEL 1990-1991]
1991 101 p In ENGLISH and FRENCH
(CTN-92-60488) Avail: NTIS HC/MF A06

The mission of the Industrial Materials Institute is to enhance the competence and competitiveness of Canadian industry through fundamental and applied research and other complementary activities related to materials processing technologies. To fulfill its mission, the Institute has defined a series of research programs with specific objectives. In 1990-91, there were 13 active programs grouped in four sections: Instrumentation and Sensors, Metals and Ceramics, Industrial Polymers, and Computer Integrated Materials Processing. In 1990-91 a total of 150 research and service contracts with industry were fulfilled, worth $893,000, a substantial increase over 1989-90. Highlights of the year's technical achievements include the development of an optical fiber pyrometer for controlling the temperature of sheet metal in a continuous annealing furnace; development of techniques for in-situ determination of lubricating oil thickness on rolled sheets; exploration of a new method of optical detection of ultrasound based on real-time holography in photorefractive crystals; completion of the fabrication and marketing of a linear band acoustic microscope of very high precision; and development of a

unique 3-dimensional simulation of mould-filling under conditions of turbulent flow for metals and alloys. CISTI

N92-27749# Fairfax Materials Research, Inc., Alexandria, VA.
THE MECHANICAL PROPERTIES OF METAL-VOID COMPOSITES Interim Progress Report
Roger Taylor Jan. 1992 2 p
(Contract N00014-91-C-0247)
(AD-A246087) Avail: NTIS HC/MF A01

Work under this contract is intended to conduct a theoretical feasibility study of the strength, toughness and vibrational damping properties of composite materials consisting of a metallic matrix with a high volume fraction (to 30 percent) of small (0.1-10 microns) pressurized voids. The premise of the approach is that a theoretical study, using both analytical and computer methods, offers a cost-effective means of assessing the probable properties of such composites and their projected utility in aerospace structures. GRA

N92-27752# Army Materials Technology Lab., Watertown, MA.
PROPERTIES OF A TZP/Al2O3 COMPOSITE AFTER LONG-TERM EXPOSURE AT 1000 C Final Report
Jeffrey J. Swab and Steven C. Stowell Dec. 1991 14 p
(DA Proj. 1L1-62101-AH-84)
(AD-A246407; MTL-TR-91-54) Avail: NTIS HC/MF A03

A commercially available tetragonal zirconia polycrystal ceramic was examined for potential use in advanced engines. Room temperature strength and toughness were determined, as well as the static fatigue life between 800 C and 1200 C. All of these properties were determined before and after a 100 hour exposure at 1000 C. The room temperature flexure strength was 1838 MPa before exposure and it decreased 23 percent after exposure. The toughness did not change with the exposure. Static fatigue testing revealed that fracture below 1100 C was due to the cracks created during machining. At 1100 C and higher slow crack growth became the dominant failure mechanism. Overall, the high temperature static fatigue life is better than yttria tetragonal zirconia polycrystal materials without Alumina but it still does not meet the strength at temperature requirements for use in advanced engines. GRA

N92-27761# Fiber Materials, Inc., Biddeford, ME.
DEMONSTRATION OF MANUFACTURING PROCESS FOR LARGE AREA, MULTILAYER PIEZOELECTRIC COMPOSITES Quarterly Report, Jul. 1991 - Jan. 1992
James Lennox, Shirley Darrah, and H. D. Batha Feb. 1992 15 p
(Contract N00014-91-C-0091)
(AD-A246662; FMI/JRL-92/001) Avail: NTIS HC/MF A03

FMI is conducting a program to demonstrate the capability of economical automated fabrication of fiber reinforced 1-3 piezoelectric composite materials. A series of test specimens is being fabricated and tested to establish relationships between composite structure and performance. The results will be used to design panels in a 30.5 x 30.5 cm (12 inches x 12 inches) multilayer structure. A modeling study at Stanford University is also being supported by specimen fabrication and testing at FMI. Four specimens from the basic set were completed and twenty-four more are in production. Eighteen specimens were also prepared for the Standard task. Further development has occurred in processing methods including a study of resin systems, development of poling procedures, and establishment of quality control standards for PZT rods. GRA

N92-27819# Three C Systems, Inc., Wynnewood, PA.
DEVELOPMENT OF TUNGSTEN BASED COMPOSITES Final Report, Feb. - Oct. 1991
Murray Kornhauser and Robert J. Dowding Feb. 1992 86 p
(Contract DAAL04-91-C-0012)
(AD-A246408; MTL-TR-92-7) Avail: NTIS HC/MF A05

The objectives of this program were to develop the test facility for very high strain rate shear testing of composite tungsten materials for use in kinetic energy (KE) penetrators, to test some composites prepared by liquid phase sintering and by the Hot Isostatic Pressing (HIP) process, and to determine whether the test samples exhibit evidence of favorable KE properties. An electromagnetic stress wave generator, with its output augmented with a conical Hopkinson bar, was used to drive a half-inch diameter punch through tungsten composite samples 1/16 inch thick and one-inch diameter. Initial strain rate on impact was up to 2.4 x 10(exp 7) sec(exp -1), decreasing as the punch was decelerated by the test sample's resistance. Metallographic examinations were made; however, it is too early to report on promising trends. GRA

N92-27827# Analytix Corp., Houston, TX.
INNOVATIVE LIFE CYCLE MANAGEMENT SYSTEMS FOR COMPOSITES, PHASE 1 Final Report, 1 Sep. - 7 Dec. 1991
Francis D. Gutowski Dec. 1991 82 p
(Contract DAAL04-91-C-0013)
(AD-A246018; AMTL-FR-12.91-Phase-1; MTL-TR-91-49-Phase-1)
Avail: NTIS HC/MF A05

The production of advanced composite structures proceeds through a sequence of stages (design, processing, quality control, etc.), each linked to preceding and following functions by material and data flows in the form of inputs, outputs and constraining factors. The integrity of a composite structure depends on a variety of reactive materials with limited shelf lives, complex production and test equipment, and exacting processes and procedures. In this environment, accurate, systematic and complete documentation of material identified is mandatory. Significant technical challenges arise in the design and implementation of an intelligent, interactive quality management system for advanced composites which is cost-effective, user-friendly, and well-adapted to both R and D-intensive and large-scale, production-oriented composites fabrication environments. Rapid prototyping was used to test the feasibility of developing an integrated, user-friendly, knowledge-based life cycle management system (LCMS) to provide comprehensive material traceability and quality management support in R and D and production environments. GRA

N92-27849# South Carolina Research Authority. Charleston.
PDES APPLICATION PROTOCOL SUITE FOR COMPOSITES (PAS-C): STATE-OF-THE-ART (SOTA) ASSESSMENT FOR THE PAS-C PROGRAM Final Report, Jul. - Nov. 1991
Jon Judd, Greg Paul, Ted Goosen, Glen Ziolko, and Larry Kames Dec. 1991 296 p
(Contract F33615-91-C-5713)
(AD-A247921; PASC005-01-00; WL-TR-92-8016) Avail: NTIS HC/MF A13

This document describes the PAS-C Program's state-of-the-art (SOTA) assessment of the Standard for Product Model Data (STEP). The assessment has been restricted to those areas that may impact the achievement of the PAS-C goal of developing an application protocol suite for composite parts. The assessment indicates that the critical STEP parts required for PAS-C are stable enough to achieve the goals of PAS-C. However, any major changes to parts 41, 42, 43, 46, and 101 during Phase 2 could potentially impact the schedule and scope for the application protocols which will be developed. In the early eighties, there was an increasing number of formal and informal standards for the exchange of product data between computer aided design (CAD) systems. Prominent among these were IGES, SET, PDDI, VDAFS, CAD 1, etc. This proliferation was leading to exactly the problem that they were trying to solve, namely data exchange between different systems, only it was now data exchange between different standards. In December 1984, a group of ten countries formed SC4 of ISO TC184 to develop a single standard to be known as STEP (Standard for the Exchange of Product Model Data). The majority of the technical work was to be done by the U.S. via the PDES (Product Data Exchange Specification) Project, which was a research endeavor sponsored by the IGES organization. GRA

N92-27856# Lawrence Livermore National Lab., CA.
THE MICROSTRUCTURES OF SCS-6 AND SCS-8 SIC REINFORCING FIBERS
M. L. Sattler, J. H. Kinney, E. Zywicz, R. Alani, and M. C. Nichols

(Sandia National Labs., Albuquerque, NM.) Jan. 1992 13 p Presented at the 16th Annual Conference on Composites, Materials, and Structures, Coca Beach, FL, 13-16 Jan. 1992
(Contract W-7405-eng-48)
(DE92-010449; UCRL-JC-107929; CONF-920144-5) Avail: NTIS HC/MF A03

The microstructures of SCS-6 and SCS-8 SiC fibers have been examined and analyzed using high resolution transmission electron microscopy (HRTEM), microdiffraction, parallel electron energy loss spectroscopy (PEELS), x-ray diffraction and x-ray spectroscopy. The results of the study confirm findings from earlier studies wherein the microstructure of the fibers have been described as consisting of (beta)-SiC grown upon a monofilament turbostratic carbon core. The present study, however, provides much more detail regarding this microstructure. For example, PEELS spectroscopy and x-ray microscopy indicate that the composition of the SiC varies smoothly from SiC plus free C near the carbon core to SiC at the midradial boundary. The SiC stoichiometry is roughly preserved from the midradial boundary to the exterior interface. HRTEM, microdiffraction, and dark field images provide evidence that the excess carbon is amorphous free carbon which is most likely situated at the grain boundaries of the SiC. The x-ray microscopy results are also consistent with the presence of two phases near the core which consist of SiC and free carbon having density less than graphite (2.25 g/cc). This complex microstructure may explain the recent observations of nonplanar failure in composites fabricated with SCS fibers.
DOE

N92-27967# Army Materials Technology Lab., Watertown, MA.
DIELECTRIC PROPERTIES OF POLYMER MATRIX COMPOSITES PREPARED FROM CONDUCTIVE POLYMER TREATED FABRICS Final Report
Louise C. Sengupta and William A. Spurgeon Feb. 1992 22 p
(AD-A248741; MTL-TR-92-3) Avail: NTIS HC/MF A03

The dielectric functions of polypyrrole-treated polyester fabric and polypyrrole-treated S-glass fabric in polyester resin matrix composites have been calculated from free-space reflectance data in the 26.5 GHz to 40 GHz range. The data indicate that for the polypyrrole-treated polyester fabric/polyester resin composites, the imaginary part of the dielectric function can be described by a conductivity over frequency relationship. On the other hand, the real part of the dielectric function for these composites changes much less than the imaginary part when the conductivity of the fabric is increased. Similar results were found for the polypyrrole-treated S-glass in polyester resin composites. However, the real part of the dielectric function for these composites increases faster than for the polyester fabric composites. Scanning electron microscopy (SEM) indicated that the difference in behavior between the treated polyester/polyester and the treated S-glass/polyester composites can be due in part to nonuniform coating of the glass fabric. In contrast, the real part of the dielectric functions of several composites fabricated using S-glass woven roving with more uniform coatings were no larger than composites of the untreated rovings.
GRA

N92-28202# National Materials Advisory Board, Washington, DC.
LIFE PREDICTION METHODOLOGIES FOR COMPOSITE MATERIALS Report, 1 Feb. 1989 - 31 Jan. 1992
31 Jan. 1992 75 p
(Contract MDA903-89-K-0078)
(AD-A248637; NMAB-460) Avail: NTIS HC/MF A04

The committee assessed the methodologies used for the life prediction of organic composites utilized in load-bearing applications. The study is a state of the art survey of composites technology and life prediction methodologies for fiber reinforced polymer composites under various loading conditions. Conclusions and recommendations are presented for future research and development to aid in the development of reliable life-prediction methods that allow the safe and predictable application of organic matrix composites in load-bearing structures.
GRA

N92-27248*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
ANALYSIS OF LDEF MICROMETEOROID/DEBRIS DATA AND DAMAGE TO COMPOSITE LAMINATES Abstract Only
R. C. Tennyson *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 37 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27274*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THERMAL CONTROL SURFACES EXPERIMENT (TCSE) MATERIALS ANALYSIS Abstract Only
Donald R. Wilkes, Edgar R. Miller (AZ Technology, Huntsville, AL.), James M. Zwiener, and Richard J. Mell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 68 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27289*# Michigan Univ., Ann Arbor.
HIGH-TOUGHNESS GRAPHITE/EPOXY COMPOSITE MATERIAL EXPERIMENT Abstract Only
David K. Felbeck *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 83 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27290*# Boeing Co., Seattle, WA. Defense and Space Group.
SPACE ENVIRONMENTAL EFFECTS ON LDEF COMPOSITES: LEADING GRAPHITE/EPOXY PANEL, SELECTED TRAILING EDGE SPECIMENS Abstract Only
Harry Dursch, Pete George, and Sylvester Hill *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 84 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27291*# Rockwell International Corp., Tulsa, OK.
EVALUATION OF LONG-DURATION EXPOSURE TO THE NATURAL SPACE ENVIRONMENT ON THE MECHANICAL PROPERTIES OF CARBON-REINFORCED EPOXY AND POLYIMIDE COMPOSITES Abstract Only
Richard F. Vyhnal, Douglas W. Welch, and J. Howard Powell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 85 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27293*# Aerospace Corp., El Segundo, CA.
SURFACE ANALYSES OF COMPOSITES EXPOSED TO THE SPACE ENVIRONMENT ON LDEF Abstract Only
Joseph J. Mallon, Joseph C. Uht, and Carol S. Hemminger *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 87 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27294*# Aerospace Corp., Los Angeles, CA. Composites Section.
THERMAL EXPANSION BEHAVIOR OF LDEF METAL MATRIX COMPOSITES Abstract Only
T. D. Le and G. L. Steckel *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 88 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*.

N92-27510# Chicago Univ., IL. Dept. of Chemistry.
THE STRUCTURE AND REACTIVITY OF BORON SURFACES Final Report, 1 Jan. 1988 - 31 Aug. 1991
Michael Trenary 26 Nov. 1991 10 p
(Grant AF-AFOSR-0111-88)
(AD-A247265; AFOSR-92-0073TR) Avail: NTIS HC/MF A02

This is the final technical report on a project designed to apply the experimental techniques of modern surface science to address issues loosely related to the combustion of boron particles. Boron particles have potential application as a fuel. Our experiments focused on the reaction of O2 with the (111) surface of Beta-rhombohedral boron to produce B2O3 and the subsequent reactions involved in desorbing B2O3 from the boron surface. We find that the reactivity with O2 is low throughout the temperature range of 300-1300 K. We find that the net uptake of O by the surface is at a maximum in the temperature range of 800-1100 K but that at most only submonolayers of B2O3 are formed. When B2O3 is directly deposited on the surface, it reacts with the substrate in the temperature range of 1100 to 1300 K to produce B2O2. In separate experiments, we have used scanning tunneling microscopy to obtain atomically resolved images of the LaB6 (100) surface. GRA

N92-27514# Battelle Pacific Northwest Labs., Richland, WA.
OXYGEN PERMEABILITY FOR SELECTED CERAMIC OXIDES IN THE RANGE 1200 TO 1700 C Final Report, Sep. 1987 - May 1989
E. L. Courtright, J. T. Prater, C. H. Henager, and E. N. Greenwell May 1991 36 p
(Contract MIPR-FY1457-87-N5054; AF Proj. 2420)
(AD-A247880; WL-TR-91-4006) Avail: NTIS HC/MF A03

Oxygen permeability as a function of temperature, was measured for several ceramic oxides over the range 1200-1700 C. Of the oxides tested, alumina, beryllia, yttria, lanthanum halfnate, and calcium zirconate exhibited the lowest permeabilities in order of decreasing resistance to oxygen transport. None of the permeability constants were less than the 10 exp -10 to 10 exp -12 gms O2/(cm x sec) needed for a useful protective coating system above 1500 C. While oxygen permeability measurements on pure silica were not made during the course of this investigation, calculations indicate that silica is very impermeable to the diffusion of oxygen. In some of the mixed oxide compounds, cation segregation was observed to occur with the more rapidly diffusing specie segregating to the side of highest oxygen potential. Thus, segregation must be considered when selecting mixed oxides for high temperature applications. GRA

N92-27634# Ottawa Univ. (Ontario). Dept. of Mechanical Engineering.
AUTOIGNITION OF SINGLE DROPLETS OF TWO-COMPONENT LIQUID FUELS
C. A. Bergeron and W. L. H. Hallett 1991 15 p Sponsored by Dept. of National Defence and Natural Sciences and Engineering Research Council
(CTN-92-60454) Avail: NTIS HC/MF A03

Measurements and predictions of the ignition delay time of single droplets of several 2-component mixtures at atmospheric pressure are presented. The model used to predict ignition delay time for 2-component fuel droplets is an extension of that developed by Bergeron and Hallett (1988) for single-component fuels. The model solves the full transient equations of continuity, fuel species diffusion, and energy in the vapor phase using finite difference techniques. The chemical reaction rate is calculated using a one-step global reaction model, with means for combining pure component rate data to an expression for a mixture. Experiments were performed using the suspended droplet technique, and results are presented for various n-paraffin mixtures. The results show that ignition is controlled by the more volatile component of the mixture. The ignition delay time is found to be nearly independent of species transport in the liquid phase. Mixture reaction rates are shown to be adequately modelled by simple linear combination of component rate data. Author (CISTI)

N92-27694# Ottawa Univ. (Ontario). Dept. of Mechanical Engineering.
A MODEL FOR THE AUTOIGNITION OF SINGLE LIQUID DROPLETS AT HIGH PRESSURE
R. Ruszalo and W. L. H. Hallett 1991 31 p Sponsored by Dept. of National Defence
(CTN-92-60493) Avail: NTIS HC/MF A03

A numerical model for the ignition of single droplets of liquid hydrocarbons at high pressures is presented. The model uses the Peng-Robinson equation of state to describe vapor-liquid equilibrium at the droplet surface. The governing equations are solved by finite difference techniques. Most of the calculations presented were made under ambient air conditions typifying those at the end of the compression stroke in a diesel engine. Ignition delay times are found to decrease substantially at high pressures, but no fundamental changes in the phenomena of ignition are observed, either for pure fuels or for 2-component mixtures. The droplet does not reach the thermodynamic critical state prior to ignition, and the effect of air absorption and transport in the liquid phase on ignition time are found to be negligible. Author (CISTI)

N92-27835# Logicon R and D Associates, Los Angeles, CA.
FRANCK-CONDON FACTORS, r-CENTROIDS ELECTRONIC TRANSITION MOMENTS, AND EINSTEIN COEFFICIENTS FOR MANY NITROGEN AND OXYGEN BAND SYSTEMS Technical Report, 1 Dec. 1989 - 30 Sep. 1991
F. R. Gilmore, R. R. Laher, and P. J. Espy (Utah State Univ., Logan.) 1 Feb. 1992 134 p
(Contract DNA001-88-C-0046)
(AD-A246065; RDA-TR-0226129003-002; DNA-TR-90-209) Avail: NTIS HC/MF A07

Air fluorescence models require accurate Franck-Condon factors and Einstein coefficients for analyzing the intensities of nitrogen and oxygen atom emissions produced by electron bombardment of air, such as in the aurora, high-altitude nuclear explosions, and rocket-borne electron gun experiments. In our previous report, improved vibrational and rotational constants based on the latest available spectroscopic measurements for several excited and ionic states important in air fluorescence modeling were derived. These constants have been used in the present work to calculate band origins, Franck-Condon factors, and r-centroids for many band systems of nitrogen and oxygen. These results, together with electronic transition moments obtained from published papers or derived here from published emission data and measured upper-state lifetimes, have been used to compute Einstein coefficients by the r-centroid method. Einstein coefficients by integration of the product of the electronic transition moment function and vibrational wavefunctions have also been computed for comparison. For band systems involving 'perturbed' electronic states, Einstein coefficients have been derived by simply normalizing published emission data to measured upper-state lifetimes. GRA

N92-27853# Massachusetts Inst. of Tech., Cambridge.
VORTEX SIMULATION OF TURBULENT COMBUSTION Annual Technical Report, Oct. 1990 - Sep. 1991
Ahmed F. Ghoniem 27 Sep. 1991 9 p
(Grant AF-AFOSR-1491-89)
(AD-A247999; AFOSR-92-0138TR) Avail: NTIS HC/MF A02

During the second year of this effort, we focused on introducing the effect of combustion in the computation of the spatially, developing shear layer and continued our analysis of the effect of density variation and upstream forcing on the growth of the mixing zone of the shear layer. We have developed a flame sheet model for the simulation of combustion at high Damkohler numbers where

the application of the transport element method proves to be rather expensive. The model uses the instantaneous local strain rate as an input from the flow computations and, by integrating a one dimensional equation, computes the rate of burning within each flamelet within the domain. GRA

N92-28009# Miami Univ., Oxford, OH. Dept. of Chemistry.
GAS-PHASE TRANSITION METAL CLUSTER CHEMISTRY USING FOURIER TRANSFORM MASS SPECTROMETRY Final Report, 1 Jul. 1990 - 31 Dec. 1991
Carolyn J. Cassady 22 Mar. 1992 6 p
(Contract N00014-90-J-1989)
(AD-A248410) Avail: NTIS HC/MF A02

Fourier transform mass spectrometry (FTMS) has been employed to study the gas-phase production, dissociation, and reactivity of several transition metal cluster systems. In particular, the production of molybdenum oxide cluster ions by secondary ion mass spectrometry (SIMS) and laser vaporization (LV) have been compared. In addition, silver and copper cluster ions have been produced and the reactivities of M sub X(+), x = 1-5, with a variety of small molecules have been probed. Unusual size-related cluster ion reactions have been observed in these studies. GRA

N92-28043# Rockefeller Univ., New York, NY.
SOME BASIC RESEARCH PROBLEMS RELATED TO ENERGY Annual Progress Report
1991 7 p
(Contract DE-FG02-88ER-13847)
(DE92-011220; DOE/ER-13847/3) Avail: NTIS HC/MF A02

A new simple relation has been found, between the transport coefficients of a fluid, in particular the viscosity, and the maximum and minimum Lyapunov exponents of the fluid in a non-equilibrium stationary state. This relation holds arbitrarily far from equilibrium, as long as the transport coefficients themselves make sense. It is hoped that this new relation will provide new insight in the nature and properties of transport coefficients or, in general, in fluid behavior far from equilibrium, i.e., in the strongly nonlinear regime. DOE

N92-28046# Pittsburgh Univ., PA. Dept. of Chemistry.
VIBRATIONAL SPECTROSCOPIC STUDIES OF SURFACE CHEMICAL INTERACTIONS IN CHEMISORPTION AND CATALYSIS
J. T. Yates, Jr. 1991 5 p
(Contract DE-FG02-88ER-13864)
(DE92-011189; DOE/ER-13864/T1) Avail: NTIS HC/MF A01

Various methods of vibrational spectroscopy are being employed to study the interaction and behavior of catalytically important species on both single crystal and high area catalytic surfaces. A number of interrelated themes are being investigated as shown below. DOE

N92-28064# Paris VI Univ. (France).
LINE INTENSITIES AND SELF-BROADENING COEFFICIENTS OF 12 CARBON 16 OXYGEN(2) AND 13 CARBON 16 OXYGEN(3) LINES IN THE LASER BAND REGION Final Report, Sep. 1990 - Sep. 1991
V. Dana 25 Mar. 1992 30 p
(Grant AF-AFOSR-0364-90)
(AD-A248612; EOARD-TR-92-06) Avail: NTIS HC/MF A03

The intensities of 12C16O2 and 13C16O2 lines have been measured in the laser band region (around 10 micrometers), using Fourier transform spectra. For each studied band the square of the transition dipole moment and Herman-Wallis coefficients have been determined. The band intensities deduced from these results are in good agreement with those obtained by the Direct Numerical Diagonalization calculations. In addition the self broadening coefficients have been measured. GRA

N92-28120# Purdue Univ., West Lafayette, IN. Dept. of Chemistry.
INITIAL SURFACE STRUCTURE OF FLAME-ANNEALED Au(100) IN AQUEOUS SOLUTION: CONSISTENCY BETWEEN IN-SITU SCANNING TUNNELING MICROSCOPY AND ELECTROCHEMICAL RESULTS
Antoinette Hamelin, Xiaoping Gao, and Michael J. Weaver 28 Feb. 1992 16 p
(Contract N00014-91-J-1409)
(AD-A246847; TR-121) Avail: NTIS HC/MF A03

The aim of this note is to clarify the initial superficial structure of gold electrodes following the commonly utilized flame-annealing pretreatment procedure, by using atomic-resolution scanning tunneling microscopy (STM), and to show the consistency of electrochemical and STM results. Initially, in 1974, it was reported that the Au(100) electrode on aqueous electrolyte exhibited some hysteresis in the differential capacity-electrode potential curves and the cyclic voltammograms within the double-layer region. This hysteresis depends on the negative potential limit and the potential-time history. In an electrolyte exhibiting only slight ionic adsorption at the potential of zero change such as perchloric acid, the potential of the capacity minimum arising from the diffuse layer was shown to be shifted in the positive direction following an excursion to more negative potentials. GRA

N92-28122# Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.
ELECTRIC FIELD INDUCED RECONSTRUCTIONS IN STM EXPERIMENTS ON Au(111) SURFACES Technical Report No. 9, period ending 1 Jan. 1991
Joachim H. Scott and Henry S. White 27 Feb. 1992 15 p
(Contract N00014-91-J-1927)
(AD-A246849) Avail: NTIS HC/MF A03

Reconstruction of atomically flat and negatively charged Au(111) surfaces during STM imaging in air is reported. Formation of corrugation line pairs of 0.2 angstroms height and 63 angstroms periodic spacing during scanning is attributed to a local electric field induced transition of the surface layer into the reconstructed phase. The concurrent formation of holes and translation of steps during reconstruction suggests that Au(111) allows for both in-plane contraction and in-plane expansion of interatomic bond distances. STM images reveal that the observed corrugated lines in the structure are mobile and anneal into a stable surface structure on the time-scale of tens of seconds. GRA

N92-28145# University of Western Ontario, London. Dept. of Physics.
HYDROGENIC ION RECOMBINATION Final Report, 30 Oct. 1989 - 29 Oct. 1991
J. B. Mitchell 31 Dec. 1991 29 p
(Grant AF-AFOSR-0042-90)
(AD-A246886; AFOSR-92-0121TR) Avail: NTIS HC/MF A03

This project studied dissociative recombination of hydrogenic molecules H2(+) and H3(+). High lying Rydberg states were found to play a principle role in the determination of final products from dissociative recombination reactions essentially independent of reaction channel. These processes play important roles in the chemistry of volume H(-) ion sources. This is the simplest molecular ion and is amendable to accurate theoretical calculation provided the reaction mechanism is well understood. In H2(+), the repulsive neutral state through which the recombination proceeds passes through the ion curve in the vicinity of the v = 1 level. GRA

N92-28207# Southwest Research Inst., San Antonio, TX.
CHEMICAL ANALYSIS OF AROMATICS IN DIESEL FUELS Final Report
B. K. Bailey and K. B. Kohl Oct. 1991 180 p
(Contract ARB-A932-125)
(PB92-167311; ARB-R-92/484) Avail: NTIS HC/MF A09

This program was performed in response to the need for improved chemical analysis of aromatic content in diesel fuel. The analytical techniques used, infrared analysis and ultraviolet spectroscopy, are familiar, convenient to run, and readily available.

Both methods proved to be fairly rugged in terms of variety of fuels, treatments, and additives of tested materials. The effort included method optimization, correlation to fluorescent indicator adsorption (FIA) results, and statistical analysis of the quality of measurements possible with the methods. Author

N92-27262*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
OBSERVATION OF FULLERENES (C60-C70) ASSOCIATED WITH LDEF CRATER NUMBER 31 Abstract Only
Filippo RadicatidiBrozolo, R. H. Fleming (Evans, Charles and Associates, Redwood City, CA), and T. E. Bunch *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 51 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27286*# LeTourneau Coll., Longview, TX.
STABILITY AND REACTIVITY OF DIMETHYLETHOXYSILANE Abstract Only
Richard E. Johnson and Douglas I. Ford *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 80 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27297*# Boeing Co., Seattle, WA. Defence and Space Group.
CONTAMINATION ON LDEF SOURCES: DISTRIBUTION AND HISTORY Abstract Only
H. Gary Pippin and E. R. Crutcher *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 91 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27298*# Aerospace Corp., El Segundo, CA.
CONTAMINATION MEASUREMENTS ON EXPERIMENT M0003 Abstract Only
Eugene N. Borson and F. Barry Sinsheimer *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 92 (For primary document see N92-27218 18-99)
(Contract F04701-88-C-0089)
Avail: NTIS HC/MF A07

N92-27486# Centre National de la Recherche Scientifique, Chatenay-Malabry (France).
THE COHERENT FLAMELET MODEL FOR PROPULSION APPLICATIONS
D. Veynante, F. Lacas, P. Boudier (Institut Francais de Petrole, Grenoble.), B. Dillies, J. M. Samaniego, T. Poinsot, and S. Candel *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 14 p Sponsored in part by SNECMA and DRET (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N92-27207# Naval Postgraduate School, Monterey, CA.
PROCESSING, MICROSTRUCTURE AND SUPERPLASTICITY IN Al-Mg-Mn ALLOYS M.S. Thesis
Chris D. Meyer Dec. 1991 72 p
(AD-A246488) Avail: NTIS HC/MF A04

A thermomechanical processing (TMP) schedule developed in previous work was modified to provide for an increasing strain and strain rate with each rolling pass. Three alloys, Al-10Mg, Al-10Mg-0.2Mn, and Al-10Mg-0.5Mn (compositions in wt. pct.), were processed utilizing this schedule. Samples were obtained following various rolling passes for subsequent microscopy analysis. Materials in both the as-rolled condition and following 25 minutes of annealing were studied. Utilizing backscattered imaging techniques with the scanning electron microscope, the microstructural evolution of these alloys during the TMP was studied. Second phase particles were observed to precipitate on grain boundaries and deformation structures in the intermediate stages of the TMP. In addition, second phase precipitates developed on MnAl6 particles through heterogenous nucleation in the Manganese containing alloys. Particle stimulated nucleation of recrystallization was observed in the latter stages of the TMP as precipitate particles coarsened. Tensile testing at 300 C demonstrated the superplastic response of each alloy, and showed that the addition of Manganese enhances superplastic response. Strain rate sensitivity coefficients were observed to initially decrease with increasing strain, but then increased with further straining. GRA

N92-27332# Naval Postgraduate School, Monterey, CA.
A STUDY OF THE MICROSTRUCTURAL BASIS FOR THE STRENGTH AND TOUGHNESS PROPERTIES OF OVERAGED HSLA-100 STEEL M.S. Thesis
Lawrence W. Comerford Jun. 1991 115 p
(AD-A246955) Avail: NTIS HC/MF A06

A certification program for the use of HSLA steel in ship construction is currently being funded by the U.S. Navy. Integral to this program is the characterization of the microstructure of the highly weldable HSLA-100 steel. In the present work, optical, scanning electron and transmission electron microscopy were employed to analyze the microstructural basis for the mechanical properties of as-quenched and tempered HSLA 100 steel in the form of 31.75 mm plate. The as-quenched microstructure contained bainite/martensite laths and a small amount of retained austenite. The strength and toughness in this specimen was based on the small transformation product packets with their fine laths and highly dislocated substructures. The best combination of strength and toughness occurred for the sample tempered at 621 C; the recovery of the dislocation substructures, the precipitation of overaged copper and carbides, and the small transformation product packet size accounted for the high toughness at this tempering temperature. The size, distribution, and composition of non-metallic inclusions were also determined; the inclusion population generally consisted of small, globular, homogeneously dispersed particles. However, exogenous oxides on the order of 50 microns were occasionally found as well as slightly brittle oxides which had broken up in the rolling direction. As a result of this investigation, it is suggested that the optimum aging temperature for 31.75 mm as-quenched HSLA-100 plate is 600 C and that improved secondary steelmaking procedures are adapted to eliminate the large, deleterious nonmetallic inclusions. GRA

N92-27346# Argonne National Lab., IL.
STRUCTURAL MATERIALS FOR HIGH-HEAT FLUX APPLICATIONS
V. V. Rybin (Leningrad State Univ., USSR) and D. L. Smith 1991 25 p Presented at the International Conference on Fusion Reactor Materials, Clearwater, FL, 17-22 Nov. 1991
(Contract W-31-109-eng-38)
(DE92-010253; ANL/CP-74100; CONF-911111-40) Avail: NTIS HC/MF A03

The structural materials for the ITER (International Thermonuclear Experimental Reactor) divertor must perform reliably under complex and diverse operating requirements. Only a limited number of materials offer a potential for meeting these requirements for the wide temperature range of interest. The candidate materials considered in the ITER design activity include copper, molybdenum, and niobium alloys. The molybdenum alloys being considered include dilute alloys of the TZM type and the Mo-Re system. Niobium alloys under consideration include Nb-V-Zr and Nb-Zr systems. Copper alloys being considered include precipitation strengthened alloys of the Glidcop and MAGT type, alloys of Cu-Mo system, and dispersion hardened bronzes. The projected operating conditions for the ITER divertor and the criteria for evaluating the

candidate materials are reviewed. This paper summarizes the data base and presents recent experimental results on these candidate divertor structural alloys. DOE

N92-27416# California Univ., Davis.
INVESTIGATION OF THE RATE-CONTROLLING MECHANISM(S) FOR HIGH TEMPERATURE CREEP AND THE RELATIONSHIP BETWEEN CREEP AND MELTING BY USE OF HIGH PRESSURE AS A VARIABLE
1991 21 p
(Contract DE-FG03-88ER-45360)
(DE92-011058; DOE/ER-45360/T4) Avail: NTIS HC/MF A03

Using high pressure as a variable, the rate-controlling mechanism for high temperature creep and the relationship between creep and melting is investigated for silicon and nickel. An apparatus is used in which the samples are heated to melting point and subjected to 1 to 3 GigaPascal pressure. The stress behavior of the materials is then studied. DOE

N92-27542*# Massachusetts Inst. of Tech., Cambridge. Lab. for Inorganic Composites of the Materials Processing Center.
RHEOLOGICAL BEHAVIOR AND MICROSTRUCTURE OF CERAMIC PARTICULATE/ALUMINUM ALLOY COMPOSITES Ph.D. Thesis Final Technical Report
Hee-Kyung Moon Sep. 1990 231 p
(Contract NAG3-808; N00014-85-K-0645)
(NASA-CR-190036; NAS 1.26:190036; MIT/OSP-99328) Avail: NTIS HC/MF A11

The rheological behavior and microstructure were investigated using a concentric cylinder viscometer for three different slurries: semi-solid alloy slurries of a matrix alloy, Al-6.5wt percent Si: composite slurries, SiC (sub p) (8.5 microns)/Al-6.5wt percent Si, with the same matrix alloy in the molten state, and composite slurries of the same composition with the matrix alloy in the semi-solid state. The pseudoplasticity of these slurries was obtained by step changes of the shear rate from a given initial shear rate. To study the thixotropic behavior of the system, a slurry was allowed to rest for different periods of time, prior to shearing at a given initial shear rate. In the continuous cooling experiments, the viscosities of these slurries were dependent on the shear rate, cooling rate, volume fraction of the primary solid of the matrix alloy, and volume fraction of silicon carbide. In the isothermal experiments, all three kinds of slurries exhibited non-Newtonian behavior, depending on the volume fraction of solid particles.
Author

N92-27619 Department of the Navy, Washington, DC.
ENVIRONMENTALLY STABLE METAL POWDERS Patent
Iver E. Anderson, inventor (to Navy) and Jack D. Ayers, inventor (to Navy) 17 Dec. 1991 6 p Filed 28 Jun. 1990
(AD-D015222; US-Patent-5,073,409; US-Patent-Appl-SN-545005; US-Patent-Class-427-217) Avail: US Patent and Trademark Office

Fine metal alloy powders coated with a protective film are disclosed which are produced by the gas atomization process. The protective films are formed during the gas atomization process by gas atomizing a molten mixture of a metal alloy containing an alloy addition agent in an atomizing gas which will selectively react with the alloy addition agent to form a thin protective film on the surface of the metal powder. GRA

N92-27821# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
DEVELOPMENT OF THE MICROSTRUCTURE BASED STOCHASTIC LIFE PREDICTION MODELS Annual Report
Marek A. Przystupa, Jimin Zhang, and Annetta J. Luevano 10 Feb. 1992 42 p
(Contract N00014-91-J-1299)
(AD-A246447) Avail: NTIS HC/MF A03

The purpose of the fatigue life prediction program at UCLA is to characterize the accumulation of the microstructural damage during fatigue of the aluminum alloys and to use obtained data in the formulation of the microstructure based stochastic life prediction models. Emphasis during the first year of the program was on the implementation of all required quantitative microscopy techniques and on the characterization of the starting microstructures in the high and low porosity 7050-T7451 commercial plate alloys. The first assembled set of data includes characteristics of the grain structures, constituent particles and pores on the sections parallel to the plate surface as a function of the distance from the surface. The results show that both alloys have partially recrystallized structure with the recrystallization levels changing from zero at the surface to about 20 percent in the center. GRA

N92-27875# Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil).
SHAPE MEMORY EFFECT ALLOYS [LIGAS DE EFEITO DE MENORIA DE FORMA]
S. Koshimizu 1992 14 p In PORTUGESE
(DE92-619932; INIS-BR-2917) Avail: NTIS HC/MF A03

Although the pseudo- or super-elasticity phenomena and the shape memory effect were known since the 1940's, the enormous curiosity and the great interest to their practical applications emerged with the development of the NITINOL alloy (Nickel-Titanium Naval Ordnance Laboratory) by NASA during the 1960's. This fact marked the appearance of a new class of materials, popularly known as shape memory effect alloys (SMEA). The objective of this work is to present a state-of-the-art of the development and applications for the SMEA. DOE

N92-27913# Brookhaven National Lab., Upton, NY.
THE DETERMINATION OF INTERFACIAL STRUCTURE AND PHASE TRANSITIONS IN Al/Cu AND Al/Ni INTERFACES BY MEANS OF SURFACE EXTENDED X RAY ABSORPTION FINE STRUCTURE
E. V. Barrera and S. M. Heald 1991 8 p Presented at the Annual Fall Meeting of the Materials Research Society, Boston, MA, 2-6 Dec. 1991
(Contract DE-AC02-76CH-00016)
(DE92-009373; BNL-46407; CONF-911202-66) Avail: NTIS HC/MF A02

Surface extended x-ray absorption fine structure (SEXAFS) was used to investigate the interfacial conditions of Al/Cu and Al/Ni shallow buried interfaces. Previous studies using glancing angle extended x-ray absorption fine structure, x-ray reflectivity, photoemission, and SEXAFS produced conflicting results as to whether or not the interfaces between Al and Cu and Al and Ni were reacted upon room temperature deposition. In this study polycrystalline bilayers of Al/Cu and Al/Ni and trilayers of Al/Cu/Al and Al/Ni/Al were deposited on tantalum foil at room temperature in ultra high vacuum and analyzed to evaluate the reactivity of these systems on a nanometer scale. It become overwhelming apparent that the interfacial phase reactions were a function of the vacuum conditions. Samples deposited with the optimum vacuum conditions showed reaction products upon deposition at room temperature which were characterized by comparisons to standards and by least squares fitting the be CuAl2 and NiAl3, respectively. The results of this study that the reacted zone thicknesses were readily dependent on the deposition parameters. For both Al on Cu and Al on Ni as well as the metal on Al conditions 10 A reaction zones were observed. These reaction zones were smaller than that observed for bilayers of Al on Cu (30 A) and Al on Ni (60 A) where deposition rates were much higher and samples were much thicker. The reaction species are evident by SEXAFS, where the previous photoemission studies only indicated that changes had occurred. Improved vacuum conditions as compared to the earlier experiments is primarily the reason reactions on deposition were seen in this study as compared to the earlier SEXAFS studies. DOE

N92-28053# Boeing Co., Seattle, WA. Aerospace and Electronics Div.
COMPUTED TOMOGRAPHY ANALYSIS OF CASTINGS Interim Report, Mar. - Dec. 1990
Richard H. Bossi and Gary E. Georgeson 2 Jan. 1992 39 p

(Contract F33615-88-C-5404)
(AD-A249099; WL-TR-91-4121) Avail: NTIS HC/MF A03

Under a preliminary testing task assignment of the Advanced Development of X-ray Computed Tomography Application program, computed tomography (CT) has been studied for its potential use in the analysis of castings. Because CT is quantitative, it offers a nondestructive evaluation (NDE) capability that can be used for engineering analysis, accurate dimensional measurement and for reconstructing three-dimensional models of cast components using Stereolithography. CT sensitivity to anomaly sizes has been measured by the use of image quality indicators. The sensitivity of a CT system, as a function of object size and system operating parameters, can be established and monitored. The three-dimensional location and definition of flaws, obtained from CT evaluation of castings, have been input into finite element engineering models to analyze the performance as a function of the casting condition. A significant cost savings in the manufacture of castings and their increased aerospace application is possible if CT evaluation and fitness-for-service criteria are used. Dimensional measurements with excellent accuracies and precision better than 0.050 mm (0.001 2 inch) have been demonstrated. The data sets from CT scanning have been converted to CAD/CAM files and input to a Stereolithography system to build a 3D plastic model of a part. GRA

N92-28119# Naval Postgraduate School, Monterey, CA.
STUDIES OF INTERMETALLIC GROWTH IN Cu-SOLDER SYSTEMS AND WETTABILITY AT SOLID-LIQUID INTERFACES M.S. Thesis
Raymond W. Martin Sep. 1991 81 p
(AD-A246836) Avail: NTIS HC/MF A05

The metallurgical bond formed between tin-lead solder and the copper substrate is characterized by the formation of an intermetallic layer. The growth of the intermetallic layer is the result of competing mechanisms, growth of the intermetallic at the intermetallic copper interface, and its dissolution at the intermetallic liquid solder interface. These were studied by determining the dissolution rates of the copper and the intermetallic compound. An experimental apparatus for the immersion emersion tensiometric method, which can be used to determine immersion and emersion contact angles and surface tension, was set up and tested. This technique offers several advantages over the conventional sessile drop and tensiometric methods, and can be utilized to study wettability at solid-liquid interfaces. GRA

N92-28136# Colorado School of Mines, Golden. Center for Welding and Joining Research.
SHIELDED METAL ARC WELDING CONSUMABLES FOR ADVANCED HIGH STRENGTH STEELS Annual Progress Report
S. Liu, G. L. Fredrickson, M. Q. Johnson, and G. R. Edwards Feb. 1992 83 p
(Contract N00014-89-J-3170)
(AD-A247005; MT-CWR-092-013) Avail: NTIS HC/MF A05

To achieve the goal of developing adequate shielded metal arc (SMA) welding consumables for advanced high strength steels, the complex relationship between flux coating and base metal must be understood. This report is concerned with the effect of flux ingredients on high strength steel welding. Submerged arc (SA) welding was first used to investigate the performance of 45 experimental flux compositions chosen from the CaCO3-SiO2-K2SiO3-CaF2-Fe system. Bead-on-plate welds were produced on 3/4 in. (19.1 mm) thick HSLA-100 steel plates using a 1/16 in. (1.59 mm) diameter Airco AX-140 welding wire. A 1.5 kj/mm (38.1 kJ/in.) linear heat input was maintained for all welds. To evaluate the effect of the experimental fluxes, two empirical basicity indexes were used: the basicity index (BI) and the Zeke basicity index (Bz). Experimental results showed definite influences of the flux ingredients, both on weld bead morphology and chemical composition of the weld metal. As the basicity of the flux increases, the weld metal oxygen content decreases and the weld metal carbon equivalent (Pcm.) increases. As weld metal oxygen content decreases, the amount of acicular ferrite and Charpy-V-notch impact toughness of the weld metal are observed to increase. The submerged arc welding results also showed that while BI can describe satisfactorily the behavior of basic fluxes, Bz is more appropriate for the acidic fluxes. GRA

N92-28139# National Materials Property Data Network, Inc., Columbus, OH.
MARINE STRUCTURAL STEEL TOUGHNESS DATA BANK, VOLUME 3 Final Report
J. G. Kaufman and Martin Prager 28 Aug. 1991 623 p
(Contract DTCG23-86-C-20062)
(AD-A247924; SSC-352-Vol-3; SSC-SSR-1311-Vol-3) Avail: NTIS HC/MF A99

The scope of this program was the development of a data bank on the toughness of steels which may be considered for marine applications such as ship hulls and drilling structures. Eleven steels of importance are included. Data from a variety of types of toughness tests were included in the database, including Charpy impact, fracture toughness, nil ductility transition, and drop-weight tear tests. The emphasis of this project was on the collection of data, not its detailed analysis, though efforts were made to assure that problems with identity of individual lots or incomplete reporting of test data were treated. The Marine Toughness Data Bank was developed both in hard copy, as summarized in this document, and in machine readable form. It is available in a searchable online version on the MPD Network where it is referred to as MARTUF. It is also available on PC disks in the original Lotus 123 format in which it was assembled from the Ship Structures Committee. It is not searchable in this format. GRA

N92-28143# Army Armament Research, Development and Engineering Center, Watervliet, NY. Benet Lab.
CORRELATION BETWEEN FRACTURE TOUGHNESS, CHARPY V-NOTCH IMPACT ENERGY, AND YIELD STRENGTH FOR ASTM A723 STEEL Final Report
J. A. Kapp and J. H. Underwood Mar. 1992 14 p
(AD-A249142; ARCCB-MR-92008) Avail: NTIS HC/MF A03

A large quantity of data for ASTM A723 steel correlating yield strength, Charpy impact energy, and fracture toughness has been compared with the Rolfe-Novak-Barsom correlation. The general conclusion is that this correlation is conservative, because if we estimate fracture toughness from Charpy impact energy measurements, the estimated toughness is less than the measured value. The data may be somewhat questionable, however, because the fracture toughness and Charpy impact energy measurements were taken at different temperatures. The results indicate that for correlation purposes, the Rolfe-Novak-Barsom relationship is an adequate estimate of fracture toughness based on Charpy impact energy and yield strength measurements. GRA

N92-27296*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SURFACE ANALYSIS OF ANODIZED ALUMINUM CLAMPS FROM NASA-LDEF SATELLITE Abstract Only
H. L. Grammer, J. P. Wightman (Virginia Polytechnic Inst. and State Univ., Blacksburg.), and Philip R. Young *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 90
(For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

For composite materials see *24 Composite Materials.*

N92-27364# Oak Ridge National Lab., TN.
X RAY SCATTERING STUDIES OF POLYIMIDE THIN FILMS FROM POLY(AMIC ACID)S FUNCTIONALIZED WITH A METHACRYLATE
M. Ree, T. L. Nunes (International Business Machines Corp.,

Hopewell Junction, NY.), and J. S. Lin 1991 21 p Presented at the 4th International Conference on Polyimides, Ellenville, NY, 30 Oct. - 1 Nov. 1991
(Contract DE-AC05-84OR-21400)
(DE92-010120; CONF-9110352-1) Avail: NTIS HC/MF A03

Using the techniques of wide-angle x-ray diffraction (WAXD) and small-angle x-ray scattering (SAXS), the morphology of several polyimide thin films prepared by thermal imidization of the photosensitive polyimide precursors was investigated and compared with that of the corresponding polyimide films thermally prepared from the non-photosensitive poly(amic acid) precursors in order to examine the morphological changes due to thermally leaving photosensitive groups linked to the precursors: PMDA-ODA, BPDA-PDA, and BTDA-ODA. In addition, the morphology of Pimel G-6246A photosensitive polyimide film with its unknown chemical structure was studied. The WAXD results indicate that the BTDA-ODA polyimide is amorphous, whereas the other polyimides exhibit a molecular order (i.e., chain order or packing order). Molecular chain order was enhanced in the PMDA-ODA by the photosensitive groups, but was disturbed in the BPDA-PDA by them. In particular, the packing order in the BPDA-PDA was improved by the photosensitive groups. In Lorentz-corrected SAXS analyses, a long period (130-160 A mean periodicity) was observed for all the polyimides except the PMDA-ODA. The micro-structure could be described by an extended chain based two-phase (ordered and less ordered phase) model with diffuse boundaries. In addition, the Guinier SAXS analyses indicate the presence of two different size voids in all the polyimide films, regardless of the precursor origin: 251-349 A and 25-54 A in radius, depending upon the type of polyimide. DOE

N92-27378*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CERAMIC COMPOSITES: ENABLING AEROSPACE MATERIALS
S. R. Levine Jun. 1992 12 p Presented at the 37th International Gas Turbine and Aeroengine Congress and Exposition, Cologne, Germany, 1-4 Jun. 1992; sponsored by the 1992 Turbo Expo-Land, Sea and Air
(RTOP 505-63-5A)
(NASA-TM-105599; E-6935; NAS 1.15:105599) Avail: NTIS HC/MF A03

Ceramics and ceramic matrix composites (CMC) have the potential for significant impact on the performance of aerospace propulsion and power systems. In this paper, the potential benefits are discussed in broad qualitative terms and are illustrated by some specific application case studies. The key issues in need of resolution for the potential of ceramics to be realized are discussed. Author

N92-27412# Argonne National Lab., IL.
NANOPHASE MATERIALS ASSEMBLED FROM CLUSTERS
R. W. Siegel Feb. 1992 25 p Presented at the 1990 Annual Technical Meeting of the Indian Institute of Metals (IIM), Tiruchirapalli, India, 14-17 Nov. 1990
(Contract W-31-109-eng-38)
(DE92-010508; ANL/CP-75656; CONF-9011279-1) Avail: NTIS HC/MF A03

The preparation of metal and ceramic atom clusters by means of the gas-condensation method, followed by their in situ collection and consolidation under high-vacuum conditions, has recently led to the synthesis of a new class of ultrafine-grained materials. These nanophase materials, with typical average grain sizes of 5 to 50 nm and, hence, a large fraction of their atoms in interfaces, exhibit properties that are often considerably improved relative to those of conventional materials. Furthermore, their synthesis and processing characteristics should enable the design of new materials with unique properties. Some examples are ductile ceramics that can be formed and sintered to full density at low temperatures without the need for binding or sintering aids, and metals with dramatically increased strength. The synthesis of these materials is briefly described along with what is presently known of their structure and properties. Their future impact on materials science and technology is also considered. DOE

N92-27442# Southern Methodist Univ., Dallas, TX. Dept. of Chemistry.
SYNTHESIS AND CHARACTERIZATION OF NEW POLY(ALKYL/ARYLPHOSPHAZENES) Final Report, 10 Mar. 1988 - 30 Sep. 1991
Patty Wisian-Neilson and Robert H. Neilson 26 Nov. 1991 20 p Prepared in cooperation with Texas Christian Univ., Fort Worth
(Contract DAAL03-88-K-0035)
(AD-A245380; ARO-25286-CH) Avail: NTIS HC/MF A03

The work described in this proposal is a continuation of work which began in our labs since 1977. The program involves a detailed study of the synthesis, characterization, and reactions of poly phosphazenes in which all substituents are attached to the phosphorus nitrogen backbone by direct P-C bonds. A large variety of homopolymers and copolymers with simple alkyl and aryl substituents, an array of materials with a number of different organic functional groups, and several graft copolymers have been prepared by simple thermolysis of silicon-nitrogen-phosphorus compounds and by subsequent reactions of polymers prepared by this method. Over 100 of these new materials have been prepared in our laboratories and range from semi crystalline, film-forming thermoplastics to amorphous gums and fluids. GRA

N92-27491 Department of the Navy, Washington, DC.
HIGH TEMPERATURE SILICIDE PROTECTIVE COATING SLURRY Patent
Charles M. Packer, inventor (to Navy), Constance A. Henshall, inventor (To Navy), and Earl K. Montgomery, inventor (to Navy) 27 Aug. 1991 4 p Filed 21 Mar. 1991
(AD-D015194; US-Patent-5,043,378; US-Patent-Appl-SN-673049; US-Patent-Class-524-440) Avail: US Patent and Trademark Office

This patent discloses a coating slurry comprised of 42 percent silicon and 10 percent chromium metal powders; 45 percent lacquer base including toluene, xylene, and a polymeric binder; and 3 percent antisettling agent. After the slurry has been applied and then subjected to a high temperature vacuum processing, a ceramic coating is obtained which provides 3000 F, high temperature oxidation protection for a refractory tantalum alloy substrate. GRA

N92-27539# Army Construction Engineering Research Lab., Champaign, IL.
HIGH-SOLIDS AND 100-PERCENT SOLIDS COATINGS: A STATE-OF-THE-ART INVESTIGATION Final Report
John Baker and Alfred D. Beitelman Jan. 1992 130 p Prepared in cooperation with Bureau of Reclamation, Denver, CO
(AD-A247557; COE/DC-TR-REMR-EM-7) Avail: NTIS HC/MF A07

The Corps of Engineers has used solution vinyl paints for corrosion protection of hydraulic structures on inland waterways for many years. These coatings have an excellent service life. However, liquid paint contains a high amount of solvents. Recently enacted volatile organic compound (VOC) air pollution regulations put severe restrictions on solvents in paints. The purpose of this research was to investigate generic high-solids and 100-percent solids coatings under laboratory conditions and identify coatings, based on their performance in the laboratory tests, as candidates for field testing. Tests were conducted on 24 coatings to provide data that could be used to write performance specifications for high-solids and 100-percent solids coatings. The most severe laboratory test was the salt water immersion test. Seven coating systems of varied generic types survived this test and the fresh water immersion test without blistering. Six of them are recommended for field testing. Eleven coating systems performed satisfactorily (did not blister) in the fresh water immersion test and are recommended for field testing. Film thickness was not a significant factor in determining coating performance in the immersion tests nor in the accelerated weathering tests. GRA

N92-27545# Missouri Univ., Rolla.
ADIABATIC SHEAR BANDS IN SIMPLE AND DIPOLAR VISCOPLASTIC MATERIALS Final Report
Romesh C. Batra Aug. 1991 169 p
(Contract DAAL03-88-K-0184)
(AD-A246055) Avail: NTIS HC/MF A08

We have analyzed the thermomechanical deformations of a viscoplastic body deformed in either simple shear or plane strain compression with the objectives of studying the initiation and development of shear bands. The material defect has been modeled by either introducing a temperature perturbation, a weaker material, a void, or a rigid non-heat-conducting inclusion at the site of the defect. The viscoplastic response of the material has been represented by various constitutive relations. It is found that different ways to model the material defect give similar results, and that the Bodner-Partom law gives results that are in better agreement with experimental findings than predictions from other flow rules. GRA

N92-27550# Tennessee Univ., Knoxville. Dept. of Engineering Science and Mechanics.
A METHOD TO DETERMINE MOISTURE PROFILES FROM TOTAL MOISTURE WEIGHT-GAIN DATA IN POLYMERIC COMPOSITES Technical Report, 1 Oct. 1990 - 30 Sep. 1991
Y. J. Weitsman 12 Sep. 1991 17 p
(Contract N00014-90-J-1556)
(AD-A247449; ESM91-1.0-MECH) Avail: NTIS HC/MF A03

This article presents a numerical approximation scheme, based upon the method of moments, to evaluate moisture distributions within a composite plate from data on total moisture weight-gain. Although it is assumed that the diffusion process remains linear, the scheme applies to moisture uptake data which depart from classical predictions. Two examples are provided to demonstrate the validity of the scheme. GRA

N92-27592# Tennessee Univ., Knoxville. Dept. of Engineering Science and Mechanics.
RESIDUAL THERMAL STRESSES IN GRAPHITE/PEEK (APC-2) LAMINATES Technical Report, 1 Oct. 1990 - 30 Sep. 1991
Y. J. Weitsman and K. Lee 12 Sep. 1991 15 p
(Contract N00014-90-J-1556)
(AD-A247450; ESM91-2.0-MECH) Avail: NTIS HC/MF A03

Thermoplastic resin composites undergo a substantial temperature drop during their post-manufacturing cool-down and sustain substantial residual stresses due to mutual geometric constraints among the multi-directional plies. In view of the time-dependent thermomechanical response of the resin, the residual stresses exhibit strong dependence on cool-down history. This paper demonstrates that it is possible to obtain an optimal cool-down path which minimizes the residual thermal stresses in APC-2 composites. GRA

N92-27618 Department of the Navy, Washington, DC.
BISLACTONE CURING AGENTS FOR EPOXY RESINS AND POLYMERS OBTAINED THEREFROM Patent
Allison M. Sikes, inventor (to Navy) and Robert F. Brady, Jr., inventor (to Navy) 15 Oct. 1991 14 p Filed 29 Mar. 1990
(AD-D015221; US-Patent-5,057,590; US-Patent-Appl-SN-500839; US-Patent-Class-528-116) Avail: US Patent and Trademark Office

Bislactone curing agents are used to cure and copolymerize with epoxy-based resins. Preferably, the copolymerization is performed using a tertiary amine catalyst. During cure, the bislactone ring opens and expands. The use of bislactones as curing agents for epoxy-based resins avoids the shrinkage and accompanying stresses which occur when epoxy-based resins are cured conventionally. The novel bislactone cured epoxy-based polymers according the present invention are less prone to failure than are conventional epoxy-based polymers. In a further embodiment, the epoxy is copolymerized with a novel bislactone monomer having at least one trifluoromethyl group. The resulting fluorinated copolymer has a reduced surface energy. GRA

N92-27704# Ohio State Univ., Columbus. Dept. of Chemistry.
PRECOMPLEXATION AND ACTIVATION OF CARBOXYLATE AND PHOSPHATE ESTERS Final Report, Mar. 1988 - Feb. 1991
Anthony W. Czarnik 2 Mar. 1992 7 p
(Contract N00014-88-K-0309; NR Proj. RR1-309)
(AD-A247778; TR-10) Avail: NTIS HC/MF A02

We are looking for reaction types that simultaneously provide for the reaction of acyl and phosphoryl groups under non-forcing conditions; suggest ways for elaboration into catalytic cycles with turnover behavior; and, survive translation onto binding moieties. To date, we have focussed on artificial metalloenzymes derived from cobalt(III) and copper(II) coordination complexes with cyclodextrins, preassociating alpha-nucleophiles, and binuclear metal ion complexes. Cyclodextrins have been prepared bearing imidazole as a group with reactivity at pH 7; pendant coordination complexes have likewise been employed. However, as potential pendant groups, alpha-nucleaophiles such as hydrazine or hydroxylamine offer unique properties. GRA

N92-27837# Johns Hopkins Univ., Baltimore, MD. Dept. of Materials Science and Engineering.
KINETICS OF SILICIDE FORMATION IN ARTIFICIALLY MULTILAYERED CHROMIUM-AMORPHOUS SILICON THIN FILMS Final Report
Robert C. Cammarata May 1991 14 p
(Contract N00014-89-K-2016)
(AD-A246483) Avail: NTIS HC/MF A03

Silicide formation in multilayered thin films of chromium and amorphous silicon was investigated by differential scanning calorimetry (DSC). The DSC traces gave a large main peak that was associated with the growth of the silicide. The growth kinetics followed a linear rate law, with an activation energy of 2.6 eV and a pre-exponential factor of 7.5 x 10 exp 7 m/sec for the rate constant. An explosive silicide reaction, observed in other metal silicon multilayered films, could not be induced in this system. Multilayered thin films were prepared by sequential electron beam evaporation of chromium and silicon onto microscope slides coated with a photoresistant. X ray diffraction analysis of the deposited films indicated that the chromium was polycrystalline and the silicon was amorphous. As is discussed below, analysis of the reaction kinetics indicates there was also an interfacial layer of (amorphous) silicide, as has been observed in as deposited nickel amorphous silicon and vanadium-amorphous silicon multilayered thin films. GRA

N92-27867# Pennsylvania State Univ., University Park. Dept. of Chemistry.
CHARACTERIZATION OF SUB-MICRON SIZED CARBON ELECTRODES INSULATED WITH A PHENOL-ALLYLPHENOL COPOLYMER
Timothy G. Strein and Andrew G. Ewing 15 Jan. 1992 35 p
(Contract N00014-90-J-1161)
(AD-A248164; TR-010) Avail: NTIS HC/MF A03

By carefully controlling the copolymerization of phenol and 2-allylphenol onto the outsides of flame etched carbon fibers, a method to construct voltammetric probes with overall physical dimensions as small as 400 nm has been developed. The primary factors controlling the formation of a thin, yet insulating film are relative monomer concentration, polymer electrodeposition time, and electrodeposition solution pH. Optimal conditions for this procedure involve electrodeposition for 12 to 14 min in 60 mM phenol and 90 mM 2-allylphenol (pH = 9.0). Success rates for construction of electrodes with total structural tip diameters below 1.5 micro is approximately 70 percent, and for construction of electrodes with approximately 400 nm tip diameters it is about 10 percent. GRA

N92-27966# Naval Surface Warfare Center, Bethesda, MD. Ship Materials Engineering Dept.
PROCESSING OF YBa2Cu3O(x) CERAMIC MATERIALS: EFFECT OF ADDITIVES Interim Report, Oct. 1990 - Sep. 1991

A. S. Rao 31 Jan. 1992 22 p
(AD-A248738; DTRC-SME-92-11) Avail: NTIS HC/MF A03

The effect of the addition of Al2O3, TiO2, PbO and Ag2O, in the concentration range 0 - 30 wt. percent, on crystal structure, morphology and superconductivity of YBa2Cu3O6+x was investigated. The results suggest that the addition of either Al2O3, TiO2 or PbO tend to stabilize the non superconducting tetragonal phase at the expense of superconducting orthorhombic phase. The oxygen from YBa2Cu3O6+x tends to migrate towards the additive and this process degrades the superconducting property of YBa2Cu3O6+x and increases the resistance. The addition of silver oxide, although it does not affect the particle size of YBa2Cu3O6+x, improves the electrical properties of the composite. GRA

N92-28126# Naval Surface Warfare Center, Bethesda, MD. Ship Materials Engineering Dept.
EFFECT OF THE ADDITION OF Al2O3 AND Ag2O ON THE MORPHOLOGY AND SUPERCONDUCTIVITY OF YBa2Cu3O(6+x) CERAMIC MATERIALS Interim Report, Oct. 1990 - Sep. 1991
A. Srinivasa Rao 11 Jan. 1992 23 p
(AD-A248736; CDNSWC-SME-92-08) Avail: NTIS HC/MF A03

In order to produce YBa2Cu3O(6+x) ceramic material with find particle size and good superconducting properties, both Al2O3 and Ag2O were added to YBa2Cu3O(6+x) during sintering. The results suggest that the addition of both Al2O3 and Ag2O does not decrease the average particle size of YBa2Cu3O(6+x); however, the superconducting properties degrade with an increase in the Al2O3 concentration. In composites containing high additive concentration, fine structure resembling that of fine pits are discernible on YBa2Cu3O(6+x) particles. GRA

N92-28148# North Carolina Univ., Chapel Hill. Dept. of Physics and Astronomy.
MATERIALS PROCESSING OF DIAMOND: ETCHING, DOPING BY ION IMPLANTATION AND CONTACT FORMATION Final Technical Report, 1 May 1987 - 31 Dec. 1991
Max L. Swanson 31 Mar. 1992 17 p
(Contract N00014-87-K-0243)
(AD-A248447) Avail: NTIS HC/MF A03

A summary of work achieved under this grant is given, including ion implantation doping of natural diamond, annealing of implantation damage, characterization methods, contact formation using a sputtering method, and plasma etching. GRA

N92-28159# Bhabha Atomic Research Centre, Bombay (India).
PLASMA SPRAY TECHNOLOGY PROCESS PARAMETERS AND APPLICATIONS
K. P. Sreekumar, J. Karthikeyan, P. V. Ananthapadmanabhan, N. Venkatramani, and U. K. Chatterjee (Bhabha Atomic Research Centre, Bombay, India) 1991 37 p
(DE92-620035; BARC-1551) Avail: NTIS HC/MF A03

The current trend in the structural design philosophy is based on the use of substrate with the necessary mechanical properties and a thin coating to exhibit surface properties. Plasma spray process is a versatile surface coating technique which finds extensive application in meeting advance technologies. This report describes the plasma spray technique and its use in developing coatings for various applications. The spray system is described in detail including the different variables such as power input to the torch, gas flow rate, powder properties, powder injection, etc. and their interrelation in deciding the quality of the coating. A brief write-up on the various plasma spray coatings developed for different applications is also included. DOE

N92-27247*# Vanderbilt Univ., Nashville, TN. Dept. of Materials Science and Engineering.
MECHANICAL PROPERTIES OF GLASSES IMPACTED BY DEBRIS OR MICROMETEORITES Abstract Only
Donald L. Kinser and David E. Wiedlocher *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 36 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27272*# Boeing Co., Seattle, WA. Defense and Space Group.
LDEF MATERIALS DATA ANALYSIS: REPRESENTATIVE EXAMPLES Abstract Only
H. Gary Pippin and E. R. Crutcher *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 66 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27273*# Aerospace Corp., El Segundo, CA.
LONG DURATION EXPOSURE FACILITY EXPERIMENT M0003 DEINTEGRATION OBSERVATION DATABASE Abstract Only
S. R. Gyetvay, H. K. A. Kan, J. M. Coggi, and M. J. Meshishnek *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 67 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27275*# Aerospace Corp., El Segundo, CA.
THERMAL CONTROL PAINTS ON LDEF: RESULTS OF SUB-EXPERIMENT 802-18 Abstract Only
Christopher H. Jaggers, M. J. Meshishnek, and J. M. Coggi *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 69 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27276*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LDEF THERMAL CONTROL COATINGS POST-FLIGHT ANALYSIS Abstract Only
Wayne S. Slemp and Philip R. Young *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 70 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27277*# Boeing Co., Seattle, WA. Defense and Space Group.
SELECTED RESULTS FOR LDEF THERMAL CONTROL COATINGS Abstract Only
Johnny L. Golden *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 71 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27278*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
FLOUORESCENCE MEASUREMENTS OF THE THERMAL CONTROL COATINGS ON LDEF EXPERIMENTS S0069 AND A0114 Abstract Only
James M. Zwiener, Richard J. Mell, Palmer N. Peters, Donald R. Wilkes, Edgar R. Miller, and John C. Gregory (Alabama Univ., Huntsville.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 72 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27279*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ATOMIC OXYGEN EFFECTS ON THERMAL CONTROL AND MIRROR COATINGS: EVALUATION OF EXPERIMENT A0034 Abstract Only
Roger C. Linton *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 73 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27280*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ATOMIC OXYGEN EFFECTS ON LDEF EXPERIMENT A0171 Abstract Only
Ann F. Whitaker, Rachel R. Kamenetzky, Miria M. Finckenor, and Joseph K. Norwood *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 74 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27281*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MONTE CARLO MODELING OF ATOMIC OXYGEN ATTACK OF POLYMERS WITH PROTECTIVE COATINGS ON LDEF Abstract Only
Bruce A. Banks, Kim K. deGroh, and Edward A. Sechkar (Cleveland State Univ., OH.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 75 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27282*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LDEF POLYMERIC MATERIALS: 10 MONTHS VERSUS 5.8 YEARS OF EXPOSURE Abstract Only
Philip R. Young, Wayne S. Slemp, and A. C. Chang (Lockheed Engineering and Sciences Co., Hampton, VA.) *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 76 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27283*# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
THE VISCOELASTIC CHARACTERIZATION OF POLYMER MATERIALS EXPOSED TO THE LOW-EARTH ORBIT ENVIRONMENT Abstract Only
Thomas Strganac and Alan Letton *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 77 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27285*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SILAZANE TO SILICA Abstract Only
Gale A. Harvey *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 79 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27287*# Queensland Univ., Brisbane (Australia). Polymer Materials and Radiation Group.
AN ESR STUDY OF THE UV DEGRADATION OF FEP Abstract Only
G. A. George, D. J. T. Hill, J. H. ODonnell, P. J. Pomery, and F. Rasoul *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 81 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27288*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
LDEF RESULTS FOR POLYMER MATRIX COMPOSITE EXPERIMENT AO 180 Abstract Only
R. C. Tennyson *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 82 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27292*# Grumman Aerospace Corp., Bethpage, NY.
EFFECTS OF THE LOW EARTH ORBIT SPACE ENVIRONMENT ON THE SURFACE CHEMISTRY OF KAPTON POLYIMIDE FILM: AN XPS STUDY Abstract Only
Myung Lee, William Rooney, and James Whiteside *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 86 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27300*# Centre National d'Etudes Spatiales, Toulouse (France).
SPACECRAFT THERMAL CONTROL COATINGS: COMPARISON BETWEEN FLIGHT RESULTS OBTAINED ON LDEF AND MIR Abstract Only
Jean-Claude Guillaumon and A. Paillous (Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse, France) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 94 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27303*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
OVERVIEW OF THE SYSTEMS SPECIAL INVESTIGATION Abstract Only
James B. Mason, Harry Dursch, and Joel Edelman (Long Duration Exposure Facility Newsletter, Silver Spring, MD.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 99 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27791*# Houston Univ., TX. Center for Superconductivity.
APPLICATION OF CERAMIC SUPERCONDUCTORS IN HIGH SPEED TURBINES
C. K. McMichael, M. A. Lamb, M. W. Lin (California Inst. of Tech., Pasadena.), K. B. Ma, and W. K. Chu *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 535-545 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N92-27363# Westinghouse Savannah River Co., Aiken, SC.
TRITIUM MEASUREMENT TECHNIQUE USING IN-BED CALORIMETRY
J. E. Klein, M. K. Mallory, and A. Nobile, Jr. 1991 7 p Presented at the 4th Topical Meeting on Tritium Technology in Fission, Fusion, and Isotopic Applications, Albuquerque, NM, 30 Sep. - 4 Oct. 1991
(Contract DE-AC09-89SR-18035)
(DE92-010061; WSRC-MS-91-017; CONF-910920-28) Avail: NTIS HC/MF A02

One of the new technologies that was introduced to the Savannah River Site (SRS) is the production scale use of metal hydride technology to store, pump, and compress hydrogen isotopes. For tritium stored in metal hydride storage beds, a unique relationship does not exist between the amount of tritium in the bed and the pressure-volume-temperature properties of the hydride material. Determining the amount of tritium in a hydride bed after desorbing the contents of the bed to a tank and performing pressure, volume, temperature, and composition (PVTC) measurements is not practical due to long desorption/absorption times and the inability to remove tritium 'heels' from the metal hydride materials under normal processing conditions. To eliminate the need to remove tritium from hydride storage beds for measurement purposes, and 'in-bed' tritium calorimetric measurement technique has been developed. The steady-state temperature rise of a gas stream flowing through a jacketed metal hydride storage bed is measured and correlated with power input

to electric heaters used to simulate the radiolytic power generated by the decay of tritium to He-3. Temperature rise results for prototype metal hydride storage beds and the effects of using different gases in the bed are shown. Linear regression results shows that for 95 percent confidence intervals, temperature rise measurements can be obtained in 14 hours and have an accuracy of +/- 1.6 percent of a tritium filled hydride storage bed. DOE

N92-27418# Lawrence Livermore National Lab., CA.
EXPLOSIVES SIMULANTS Preliminary Report
G. L. Moody, C. O. Pruneda, and R. L. Simpson Mar. 1992 6 p
(Contract W-7405-eng-48)
(DE92-011074; UCRL-ID-110151) Avail: NTIS HC/MF A02

Two TNT high-explosive simulants were developed. Small scale testing has shown them to be insensitive to the following: impact, spark, friction, temperature, and shock. The materials were scaled to 0.5 kg quantities and samples were given to the Protective Services Department for field evaluation using explosives detecting canines. DOE

N92-27492 Department of the Navy, Washington, DC.
HIGH ENERGY EXPLOSIVE YIELD ENHANCER USING MICROENCAPSULATION Patent
Joseph F. Colick, inventor (to Navy) 17 Sep. 1991 5 p Filed 27 Mar. 1991
(AD-D015195; US-Patent-5,049,212; US-Patent-Appl-SN-676772; US-Patent-Class-149-3) Avail: US Patent and Trademark Office

The invention consists of a class of explosive yield enhancers created through the use of microencapsulation techniques. The microcapsules consist of combinations of highly reactive oxidizers that are encapsulated in either passivated inorganic fuels or inert materials and inorganic fuels. Depending on the application, the availability of the various oxidizers, and the fuels, the microcapsules can be customized to increase the explosive yield or modify other characteristics of high explosives. The microcapsules prevent premature reaction of the component oxidizers and inorganic fuel to allow their use in munitions and propellant applications. The physical stability of the microcapsules, in combination with epoxies, plastics, and composites, also permits microcapsules to be included in warhead structural components. GRA

N92-27562# Chicago Univ., IL. Dept. of Chemistry.
FIRST, SECOND, AND THIRD GENERATION HIGH ENERGY MATERIALS FROM CUBANE Final Technical Report, 1 Oct. 1986 - 28 Feb. 1991
Philip E. Eaton 29 Feb. 1992 5 p
(Contract N00014-86-K-0553)
(AD-A247559) Avail: NTIS HC/MF A01

New generations of super energetic materials are required for the SDI mission. Cubane is a very dense, exceptionally energetic hydrocarbon; its heat of formation, density, and strain energy are all extraordinarily high in combination, unexceeded by any other stable hydrocarbon. This dense, energetic system has 8 identical methane C-H groups at which hydrogen may be replaced by energy-rich substituents. Such substitution can provide smoke free propellant components of enormous power, far superior to present-day metalized propellants. For example, tetrakis-(dinitramino)cubane admixed with 15 percent BAMO/NMMP should have an Isp (into vacuum) 24 seconds greater than HAP with 15 percent HTPPB. Realizing even a fraction of this would lead to enormous payload enhancements. This project was designed to discover methods to attach highly oxidized, energetic groups onto the cubane nucleus. Specifically, we are interested in developing the chemistry required to place nitro groups, trinitromethyl groups, fluorodinitromethyl groups, high-energy amine salts (e.g., perchlorates, nitrates, nitronates, etc, onto the cubane nucleus. These are very special groups, ones not often dealt with in organic synthesis. As these groups are neither ordinary nor easy to work with, manipulating them onto a cubane nucleus requires not only a fundamental understanding of cubane chemistry, but also development of new methodology tailored to the tasks at hand. GRA

N92-27631# Pennsylvania State Univ., University Park.
A STUDY OF THE GAS-PHASE CHEMISTRY OF SOLID PROPELLANT INGREDIENTS USING CO2 LASER HEATING
Thomas A. Litzinger 1991 10 p
(Contract N00014-89-J-1238)
(AD-A246510) Avail: NTIS HC/MF A02

This research program is designed to address the critical need for data on the gas phase chemistry of solid propellants through the development and application of a Microprobe Mass Spectrometer (MPMS) system. The MPMS system is being used to study the gas-phase chemistry occurring above solid propellant ingredients and actual solid propellants when they are heated and/or ignited by the heat flux from a Carbon dioxide laser. Currently the MPMS system uses quartz microprobes with orifice sizes of twenty microns which results in a spatial resolution of approximately 100 microns. In addition to the MPMS system, direct and Schlieren photography are being used to study the flame structure. Additionally, twenty-five micron thermocouples are being used to measure the gas-phase temperature profile. The specific goal of this research is to obtain detailed species profiles of the major reacting species above the surface of the individual propellant ingredients and actual propellants in order to obtain an improved understanding of the controlling chemical processes and of the interactions of binders and oxidizers in heterogeneous propellants. In the testing both heterogeneous and homogeneous propellants are being studied as well as their individual ingredients. GRA

N92-27927# Institut Franco-Allemand de Recherches, Saint-Louis (France).
EROSION IN A 20-mm-GUN PRODUCED BY NORMAL AND LOVA PROPELLANT CHARGES
F. Seiler, K. Zimmermann, and F. Schedlbauer (Fraunhofer-Inst. fuer Treib- und Explosivstoffe, Pfinztal-Berghausen, Germany, F.R.) 11 May 1989 33 p Presented at the US/FRG DEA-1060-Meeting, Unterluess, Fed. Republic of Germany, 16-19 May 1989
(Contract BMVg-T/R-760/I-0014/I-1714)
(ISL-CO-215/89; ETN-92-98030) Avail: NTIS HC/MF A03

Studies of gun erosion were carried out in a 20 mm gun. The aim of the experiment was to examine the influence of the addition of a mixture of 4 percent titanium dioxide and wax (Swedish additive), the propellant charge type (normal and low vulnerability (LOVA) propellants), and distinct driving bands (sintered iron, tombac, and plastic). The erosion measurements showed that it can be assumed that one parameter influencing the erosion action of a propellant charge is its heat of explosion. With regard to this effect, the LOVA propellants behave like normal propellants. Relating to erosion reduction the best results were gathered with additive insertion as a liner around the front part of the propellant charge and in using a plastic driving band. The reinforcement with fiberglass yields a greater amount of erosion than was caused by the plastic band. The worst result was obtained with a sintered iron driving band. ESA

N92-28070# Phillips Lab., Edwards AFB, CA.
ADVANCED MATERIALS FOR TURBOMACHINERY. TECHNICAL MEMO NUMBER 2: ADVANCED MATERIALS COMPATIBILITY WITH STORABLE PROPELLANTS (MONOMETHYL HYDRAZINE AND NITROGEN TETROXIDE) Final Report, Jun. 1990 - Jan. 1991
Thomas R. Hill Oct. 1991 12 p
(AD-A246725; AD-E200838; PL-TR-91-3058) Avail: NTIS HC/MF A03

The advanced materials for turbomachinery (AMT) program is tasked with determining which advanced materials currently on the market are the most suitable for application to turbopumps. Initial work involves pumps carrying storable propellants (Monomethyl Hydrazine (MMH) and Nitrogen Tetroxide (NTO), and the first tests to be completed are compatibility tests of Liquid Crystal Polymers (LCP's) along with some Metal Matrix Composites (MMC's) and Ceramic Matrix Composites (CMC's). Preliminary investigations were completed, and most of the LCP'S have shown themselves to be unsuitable for storable propellant applications.

One LCP, however, was shown to be compatible with NTO and it is under consideration for use in further applications. The CMC's and MMC's examined have proven to be more compatible than LCP's, but they are not impervious to the propellants. Testing was not carried out under extreme conditions, (high temperatures, samples under stress), so it does not necessarily indicate how a material will perform under actual turbopump conditions. GRA

N92-28161# Pennsylvania State Univ., University Park.
A STUDY OF GAS PHASE CHEMISTRY OF SOLID PROPELLANTS USING A MICROPROBE MASS SPECTROMETER SYSTEM. RESULTS FOR RDX, BLX-9, XM-39, M-9 AND JA-2 Annual Report No. 3
Thomas A. Litzinger 1991 20 p
(Contract N00014-89-J-1238)
(AD-A245907) Avail: NTIS HC/MF A03

This research program is designed to address the critical need for data on the gas-phase chemistry of solid propellants through the development and application of a microprobe mass spectrometer (MPMS) system. The MPMS system is being used to study the gas-phase chemistry occurring above solid propellant ingredients and actual solid propellants when they are heated and/or ignited by the heat flux from a CO2 laser. In addition to the MPMS system, direct and Schlieren photography are being used to study the flame structure and twenty-five micron thermocouples are being used to measure the gas-phase temperature profile. During the last year nearly fifty tests were performed with neat RDX as well as with composite, XM-39 and BLX-9, and double-base propellants, M-9 and JA-2. Measurements of gas-phase species and temperature profiles for neat RDX and two RDX composite propellants show that while the chemical species detected are similar, the gas-phase structure for these propellants is significantly different. For incident laser energy fluxes above 100 W/sq cm, all three propellants exhibited a primary flame caused by the reaction of CH2O and NO2. The mole fraction of CH2O at or near the sample surface was approximately 0.20 for RDX and XM39, but was about 0.33 for BLX9 due to the addition of CH2O from the decomposition of the BTTN energetic plasticizer. GRA

29 MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications.
For biological materials see *55 Space Biology*.

N92-28203*# National Aeronautics and Space Administration, Washington, DC.
INFORMATION SYSTEMS REQUIREMENTS FOR THE MICROGRAVITY SCIENCE AND APPLICATIONS PROGRAM
M. E. Kicza and J. R. Kreer (Bionetics Corp., Washington, DC.) Sep. 1990 4 p
(NASA-TM-107932; NAS 1.15:107932) Avail: NTIS HC/MF A01

NASA's Microgravity Science and Applications (MSAD) Program is presented. Additionally, the types of information produced within the program and the anticipated growth in information system requirements as the program transitions to Space Station Freedom utilization are discussed. Plans for payload operations support in the Freedom era are addressed, as well as current activities to define research community requirements for data and sample archives. Author

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

N92-27692# National Research Council of Canada, Ottawa (Ontario). Inst. for Mechanical Engineering.
INSTITUTE FOR MECHANICAL ENGINEERING Annual Report, 1990-1991 [RAPPORT ANNUEL DE L'INSTITUT DE GENIE MECANIQUE, 1990-91]
1991 60 p In ENGLISH and FRENCH
(CTN-92-60489) Avail: NTIS HC/MF A04

The Institute of Mechanical Engineering has the objectives of supporting in Canada the following activities: improvement of vehicles, propulsion systems, and transportation-related facilities and services; improvements in the design and operation of maritime engineering works; protection of the environment; enhancement of energy flexibility; advancement of firms engaged in manufacturing and resource extraction; and related programs of other government departments and agencies. In 1990-91 the Institute, which had changed its name that year from the Division of Mechanical Engineering, consolidated its research activities from nine laboratories to six programs. Activities in these six programs are described: Advanced Manufacturing Technology, Coastal Zone Engineering, Cold Regions Engineering, Combustion and Fluids Engineering, Ground Transportation Technology, and Machinery and Engine Technology. CISTI

N92-27715# Rocky Research Corp., Boulder City, NV.
SOLID-VAPOR ADSORPTION REFRIGERATION SYSTEM DEVELOPMENT Final Report, Mar. 1990 - May 1991
U. Rockenfeller, L. Kirol, and B. Graebel Dec. 1991 47 p
(Contract GRI-5089-296-1941)
(PB92-164383; GRI-91/0382) Avail: NTIS HC/MF A03

The study describes the development of heat-activated industrial refrigeration systems using ammoniated complex compound sorption media. The focus was on single-stage cycles for low temperature (+20 F and below) refrigeration. Compared to vapor compression refrigeration, these cycles have the advantages of lower operating energy costs, reduction of peak electrical demand and associated demand charges, and reduced maintenance costs due to replacement of the compressor with solid-state sorbers. In many cases, particularly for refrigeration at -40 F and below, complex compound sorption cycles also have the potential for lower first cost than conventional electrically driven refrigeration systems. Technical issues addressed included the following: economic optimization of sorber design, demonstration of cyclic stability of the sorption reactions, construction material compatibility, and reactor scale-up. Sorption reactions for refrigeration at -40 and -70 F were demonstrated. Optimum heat exchanger configuration, complex compound loading, and cycle time were determined. GRA

N92-27926# Sheffield Univ. (England). Dept. of Control Engineering.
A SIMPLIFIED NONLINEAR MODEL FOR A COMBINED HEAT AND POWER (CHP) SYSTEM
M. Karrari and H. Nicholson Nov. 1990 25 p
(RR-416; ETN-92-98849) Avail: NTIS HC/MF A03

Steady state errors, hunting, and high interactions were reported in the operation of Combined Heat and Power (CHP) systems working with steam turbines. The design of currently employed regulators in industry is usually based on a linear model of the system. An improved system regulation can only be achieved if a more accurate mathematical model is available. A simplified nonlinear model is derived which can be used to investigate the present problems and evaluate new controller performances. ESA

N92-28180# Air Force Systems Command, Bolling AFB, Washington, DC.
THE METRICS HANDBOOK
Aug. 1991 77 p
(AD-A248591) Avail: NTIS HC/MF A05

This handbook is designed to help you develop and use good metrics. It is intended to provide you with sufficient information to begin developing metrics for your own objectives, processes, and tasks, and to steer you toward appropriate actions based on the data you collect. It should be viewed as a road map to assist you in arriving at meaningful metrics and to assist in continuous process improvement. This handbook is the result of a team effort by people from the product divisions, test centers, and other command organizations who have struggled to develop their own metrics. Chapter One answers your most basic questions about metrics. Chapter Two provides the characteristics of good metrics and discusses what metrics are NOT meant to be. Chapter Three provides a methodology for developing metrics and introduces the concept of the metric package. Chapter Four explains performance and introduces some of the tools used in analyzing processes and developing metrics. Chapter Five presents some guidelines and ideas for metrics presentation. Chapter Six addresses implementation--what to do with metrics once you have them. The handbook closes with three appendices. Appendix A is a brief orientation to the eight basic tools introduced in Chapter Four. Appendix B is a glossary of terms helpful in understanding metrics. Appendix C is a resource of references that will provide you with more help. GRA

32 COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking.* For search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation.*

N92-27339# Naval Postgraduate School, Monterey, CA.
PERFORMANCE OF A FAST FREQUENCY-HOPPED NONCOHERENT MFSK RECEIVER WITH RATIO-STATISTIC COMBINING OVER RICIAN FADING CHANNELS WITH PARTIAL-BAND INTERFERENCE M.S. Thesis
John F. Riley Jun. 1991 115 p
(AD-A247034) Avail: NTIS HC/MF A06

An error probability analysis is performed for a fast frequency-hopped, frequency-shift keyed noncoherent receiver with ratio-statistic combining for a Rician channel with partial-band interference. Results are obtained for binary and M-ary FSK receivers where M is 4, 8, or 16. Both envelope and square-law detectors were analyzed. The probability of bit error is examined for different levels of diversity, thermal noise, severity of fading, fractions of bandwidth jammed, and varying jamming power. Comparisons for the different parameters are done to determine when diversity should be used. For the special case when there is no diversity, an analytic expression for receiver performance is obtained, and the performance of a receiver using envelope detection is found to be identical to that of a receiver using square-law detection for this special case. The results show that, for diversities of three and four, the envelope detector performs better than the square-law detector. It is shown that, for low signal-to-jammer ratios, diversity is generally a disadvantage, and for high signal-to-jammer ratios, diversity is generally an advantage. The transition is dependent on thermal noise and the value of M. GRA

N92-27386# Rome Lab., Griffiss AFB, NY.
IMPROVEMENT IN RADAR DETECTION UNDER SCAN TO SCAN PROCESSING AND SCAN RATE REDUCTION Ph.D. Thesis
Joon Song and Donald D. Weiner Jun. 1991 322 p
(AD-A247350; RL-TR-91-80) Avail: NTIS HC/MF A14

Recent advances in signal processing technology have resulted in a significantly greater computational capability at lower cost. As a result, many investigations are currently under way to determine how increased signal processing can be used to improve the detection performance of existing radars without requiring major equipment modifications. Two approaches towards this goal are examined. The first is a scan-to-scan processing (SSP) also known as track-before-detect (TBD). The second involves scan rate reduction along with efficient post detection integration. Detailed analyses are carried out for the two methods. GRA

N92-27400# Naval Postgraduate School, Monterey, CA.
MANAGEMENT OF THE FLEET SATELLITE COMMUNICATIONS SATELLITE ACQUISITION FOR THE NAVAL POSTGRADUATE SCHOOL M.S. Thesis
David E. Eyler Jun. 1991 57 p
(AD-A246969) Avail: NTIS HC/MF A04

This thesis discusses the management of the acquisition of the fleet Satellite Communications Satellite (FLTSATCOM) Qualification Model for the Naval Postgraduate School. The preparations, scheduling, and accomplishment of the delivery and the efforts required to establish the FLTSATCO laboratory are discussed. The interaction between the Naval Postgraduate School, various government agencies, and the FLTSATCOM prime contractor necessary to accomplish the project is also described. GRA

N92-27503# Naval Postgraduate School, Monterey, CA.
NAVSPASUR SENSOR PERFORMANCE STUDY M.S. Thesis
Stephen F. Schaaf Sep. 1991 52 p
(AD-A246592) Avail: NTIS HC/MF A04

The Naval Space Surveillance Command (NAVSPASUR) began in the late 1950's. Operating with a formidable array of three large transmitters and six receiving stations, the command has carried out the mission of surveying and cataloging all space objects in near earth orbit. To date over 21,000 artificial satellites have been tracked and catalogued by the command. In order to document how effectively the fence was in accomplishing this mission, this thesis was undertaken to provide NAVSPASUR with a statistics based measure of demonstrated system detection performance. It is the purpose of the thesis to provide NAVSPASUR with a scientific study and evaluation of system performance and capabilities as demonstrated in recent operational periods. Following a dicussion and review of NAVSPASUR operating parameters, a statistical analysis of system performance will be presented. This analysis will consist of data regressions performed by the GRAFSTAT and SAS programs imbedded in the Naval Postgraduate School mainframe computer. The final result of this effort will be to provide NAVSPASUR with an independently derived, statistically based means to predict future probabilities of success in detecting satellites of known radar cross section in operational orbits. GRA

N92-27506# Phillips Lab., Hanscom AFB, MA.
AN 11-CM FULL-MATRIX POLARIMETRIC RADAR FOR METEOROLOGICAL RESEARCH
James I. Metcalf, Alexander W. Bishop, Richard C. Chanley, Timothy C. Hiet, and Pio J. Petrocchi 26 Jun. 1991 43 p
(AD-A246893; AD-E200867; PL-TR-91-2167; ERP-1088) Avail: NTIS HC/MF A03

The Geophysics Directorate operates a unique 11-cm (S-band) coherent polarimetric radar. The radar can transmit signals of alternating orthogonal polarizations, with either circular or linear basis, and receive signals of polarizations identical and orthogonal to that of the transmitted signal. The received signals, comprising logarithmic power and in-phase and quadrature components of both polarizations, are sampled in 50 selectable gates and recorded for off-line analysis. The radar antenna and the polarimetric data acquisition are controlled by interactive computer programs. Measurements are underway to characterize the performance of the radar, describe microphysical attributes of clouds and precipitation, and identify the effects of changing electric fields on the orientations of hydrometeors. Examples of these measurements are shown. Related facilities are described briefly. Author (GRA)

N92-27516*# Computer Technology Associates, Inc., Rockville, MD.
COMMUNICATION ANALYSIS FOR THE EXPENDABLE EXPLORER SPACECRAFT
Sep. 1990 134 p
(Contract NAS5-30680)
(NASA-CR-189273; NAS 1.26:189273) Avail: NTIS HC/MF A07

This report provides the results of communication analysis for the baseline and enhanced performance spacecraft designs proposed for Expendable Explorer Spacecraft (EES) series of missions. Five classes of orbits (Geosynchronous, Circular-28 degree inclination, Polar-90 degree inclination, Sunsynchronous-97 degree inclination, Molniya orbit) and a set of candidate instrument payloads provided by the ESS Study Manager were used to formulate the basis for the ESS Communications Study. The study was performed to assess the feasibility of using Space Network or ground stations for supporting the communications, tracking and data handling of the candidate instruments that are proposed to be launched into the desired orbit. Author

N92-27520*# North Carolina State Univ., Raleigh. Dept. of Electrical and Computer Engineering.
HIGH RESOLUTION FREQUENCY TO TIME DOMAIN TRANSFORMATIONS APPLIED TO THE STEPPED CARRIER MRIS MEASUREMENTS Final Technical Report, 1 Jan. 1991 - 30 Jun. 1992
Sasan H. Ardalan 24 Jun. 1992 133 p
(Grant NAG1-1219)
(NASA-CR-190432; NAS 1.26:190432) Avail: NTIS HC/MF A07

Two narrow-band radar systems are developed for high resolution target range estimation in inhomogeneous media. They are reformulations of two presently existing systems such that high resolution target range estimates may be achieved despite the use of narrow bandwidth radar pulses. A double sideband suppressed carrier radar technique originally derived in 1962, and later abandoned due to its inability to accurately measure target range in the presence of an interfering reflection, is rederived to incorporate the presence of an interfering reflection. The new derivation shows that the interfering reflection causes a period perturbation in the measured phase response. A high resolution spectral estimation technique is used to extract the period of this perturbation leading to accurate target range estimates independent of the signal-to-interference ratio. A non-linear optimal signal processing algorithm is derived for a frequency-stepped continuous wave radar system. The resolution enhancement offered by optimal signal processing of the data over the conventional Fourier Transform technique is clearly demonstrated using measured radar data. A method for modeling plane wave propagation in inhomogeneous media based on transmission line theory is derived and studied. Several simulation results including measurement of non-uniform electron plasma densities that develop near the heat tiles of a space re-entry vehicle are presented which verify the validity of the model. Author

N92-27564# Naval Ocean Systems Center, San Diego, CA.
ALE FREQUENCY SELECTION FOR NAVY MODEMS: ANALYSIS
C. Fuzak, Jr. Dec. 1991 23 p
(AD-A247569; NOSC-TR-1461) Avail: NTIS HC/MF A03

The objective is to develop a simple model for HF (2-30 MHz) modem performance as a function of various channel parameters, and to develop techniques for predicting those parameters. Modem performance was modeled based on three parameters: signal-to-noise ratio (SNR), delay spread, and Doppler spread. Each of these parameters is measurable using known techniques. The model demonstrates the inadequacy of using only SNR and bit error-rate estimates for frequency selection in automatic link establishment (ALE) algorithms. The benefits from incorporating delay and Doppler spreads in the ALE frequency selection algorithm are sufficiently clear to justify extension of the algorithms to include these factors. Further research is required to verify the sufficiency of SNR, delay spread, and Doppler spread for frequency selection. GRA

N92-27565# Naval Ocean Systems Center, San Diego, CA.
EVALUATION OF METHOD OF MOMENTS CODES: UNIVERSITY OF HOUSTON JUNCTION AND NUMERICAL ELECTROMAGNETIC CODE
J. W. Rockway, J. C. Logan, and C. A. Deneris Oct. 1991 80 p
(AD-A247570; NOSC-TD-2220) Avail: NTIS HC/MF A05

The principal goal of the Electromagnetic Compatibility (EMC) Project is to minimize exterior electromagnetic interference (EMI) problems during the life-cycle of Navy surface ships. An important aspect of mitigating exterior EMI problems is the characterization of antenna performance. At the present time, for shipboard MF and HF (2 to 30 MHz) antennas, there exists two techniques for performing a topside antenna study: brass scale modeling and numerical modeling. Brass scale models have a few drawbacks: they are time-consuming to build, difficult to rapidly modify, troublesome to accurately measure near fields on scale models, and they are somewhat limited in their application. This report is an evaluation of the progress in development of two advanced computer programs for antenna modeling. One is the performance of the JUNCTION Code, under development at the University of Houston, and the other is the performance of the Numerical Electromagnetic Code - Version 4 (NEC4) being developed at the Lawrence Livermore National Laboratory. GRA

N92-27600# Naval Postgraduate School, Monterey, CA.
COMPARISON OF JANUS AND FIELD TEST AIRCRAFT DETECTION RANGES FOR THE LINE-OF-SIGHT FORWARD HEAVY SYSTEM M.S. Thesis
Eugene P. Paulo Sep. 1991 49 p
(AD-A246047) Avail: NTIS HC/MF A03

The feasibility of accrediting the Janus combat simulation for use with an Army concept called Model-Test-Model is analyzed. Aircraft detection ranges from an operational field test are compared to similar ranges generated by the Janus combat simulation. Means and distributions of detection ranges for both helicopter and fixed-wing aircraft are studied. Methods of collecting detection data in field tests and representing aircraft in Janus must be improved for Janus to be accredited for aircraft detection range analysis of field tests. Author (GRA)

N92-27615 Department of the Navy, Washington, DC.
MID-RANGE UV COMMUNICATIONS Patent
Myer Geller, inventor (to Navy) and George A. Evanoff, Jr., inventor (to Navy) 29 Oct. 1991 9 p Filed 3 Mar. 1989
(AD-D015213; US-Patent-5,062,154; US-Patent-Appl-SN-318988; US-Patent-Class-359-154) Avail: US Patent and Trademark Office

Mid-range communications are improved with a transmitter having an elongate omni-directionally radiating tube of ultraviolet (UV) energy that are focussed by a compound parabolic reflector to within a designated azimuth and/or elevation.The configuration of the reflector gives a broad beam directivity over a receiver target area to the exclusion of other bearings and elevations such that selected receiving stations can be designated between moving or unstable communication platforms, such as aircraft or ships. Because scattering occurs at angles larger than the direct beam, the requirement for accurate tracking mechanisms is further relaxed. Furthermore, these extra scattered photons increase the link distance. The need for very small divergence transmitters, like lasers, is eliminated permitting inexpensive, efficient UV lamps to be used with compound reflectors as transmitter sources. GRA

N92-27660# Naval Postgraduate School, Monterey, CA.
A CONCEPTUAL DESIGN FOR THE TELECOMMUNICATIONS EMERGENCY DECISION SUPPORT SYSTEM (TEDSS) M.S. Thesis
Stuart N. Manning Sep. 1991 88 p
(AD-A246045) Avail: NTIS HC/MF A05

The Telecommunications Emergency Decision Support System (TEDSS) was developed by the National Communications System (NCS) to assist in the management of national communication

assets during times of emergency. TEDSS is currently approaching the end of its system life, and is only marginally capable of meeting existing and future requirements. The personal computer-based system uses a structured menu-oriented interface developed within an INGRES database management system application environment. This system provides predefined queries and menus which minimize the amount of decision support provided for emergency management. This thesis reviews the current operational capabilities of TEDSS and the emergency decision making environment in which it operates. It proposes a conceptual shift of TEDSS from its current textually-oriented information system to a graphically-oriented Tactical Decision Aid (TDA). The proposed system would employ a Graphical User Interface (GUI) providing a standard interface to a Geographical Information System (GIS). The GIS would provide a map-based environment in which the user manipulates data and models. Software and hardware issues relating to the development of a TDA-based TEDSS are discussed. GRA

N92-27695# Defence Research Establishment, Ottawa (Ontario). Airborne Radar Section.
CLASSIFICATION OF SAR SHIP IMAGES WITH THE AID OF A SYNTACTIC PATTERN RECOGNITION ALGORITHM
Robert Klepko Jul. 1991 26 p
(DND Proj. 021LA)
(DREO-TN-91-10; CTN-92-60496) Avail: NTIS HC/MF A03

Synthetic aperture radar (SAR) images of ships are a function of the location of scatterers, the SAR system frequency, the radar-to-ship viewing angle, the amount and type of sea-induced ship motion, and the length of the aperture. Because of the dependence on these variables, the number of images representing any one ship is large. Fast classification response times are required; consequently, some form of computer-based aid for the radar operator is justified. A syntactic pattern recognition algorithm called the Coarse Feature Classifier (CFC) has been developed for such a purpose. By having the algorithm perform some of the tasks that the operator normally does, the potential benefits of improved accuracy and speed of classification are obtained, in addition to reduced operator fatigue. The algorithm extracts numerous features from the input SAR image which are then compared to a library of similar features in order to select the ship(s) from the library which best resemble the input ship image. The extraction and comparison of features is a multi-step process. The problem of SAR image classification is explained through the use of examples, and details of the operation of the CFC are discussed for airborne applications. Author (CISTI)

N92-27717# Naval Surface Warfare Center, Silver Spring, MD.
INFRARED HORIZON DETECTION Final Report, 1 Dec. 1990 - 31 May 1991
Monte S. Kaelberer 31 Jul. 1991 59 p
(AD-A246904; NAVSWC-TR-91-460) Avail: NTIS HC/MF A04

THe sea/sky interface in the 3 to 5 micron and 8 to 12 micron regions is examined in this report. The efficacy of two algorithms for delineating the optical horizon is studied using infrared data taken with the Infrared Analysis Measurement and Modeling Program (IRAMMP) sensor at Port Hueneme, California, and Marathon Florida. Several signal processing methods are described along with the performance results of computer simulations exercising the various algorithms against the IRAMMP data. Meteorological data collected at the fields sites is used to aid in explaining the varying degrees of contrast exhibited by the database. GRA

N92-27758# Digicomp Research Corp., Ithaca, NY.
INTEGRATED MULTI-DOMAIN RADAR DEMONSTRATION Final Report, Apr. 1989 - Apr. 1991
Carol C. Shilepsky, Mary Bucknell, and Rick Taylor Dec. 1991 169 p Prepared in cooperation with SENSIS Corp., Dewitt, NY
(Contract F30602-89-C-0045)
(AD-A246653; RL-TR-91-343) Avail: NTIS HC/MF A08

The objective of the IMRD program is to apply artificial intelligence techniques to the adaptive control of a state-of-the-art radar environment. The radar operates in the C-Band and is located within the Rome Laboratory Surveillance Facility (RLSF), Building 106, Griffiss Air Force Base (GAFB). The artificial intelligence is embedded in an adaptive control expert system which is written in Prolog. This system identifies sources of interference in each antenna beam position of the surveillance region and responds with the appropriate adaptive controls to maximize the probability of target detection consistent with operator-specified tactical objectives. In addition, the system has the following features: (1) radar inputs provided by a real, as opposed to a simulated, radar; (2) real-time operation with one scan response time of ten seconds or less; (3) modular design for rulebase and system evolution; (4) extensive parameterization for different radar configurations and operational specifications; and (5) control of a large number of radar parameters. The report includes IMRD organization, parameterization options for configuring it to different environments, the expert system software development, and results. GRA

N92-27783# Naval Postgraduate School, Monterey, CA.
THE ERROR PERFORMANCE ANALYSIS OVER CYCLIC REDUNDANCY CHECK CODES M.S. Thesis
Hee B. Yoon Jun. 1991 77 p
(AD-A246020) Avail: NTIS HC/MF A05

The burst error is generated in digital communication networks by various unpredictable conditions, which occur at high error rates, for short durations, and can impact services. To completely describe a burst error one has to know the bit pattern. This is impossible in practice on working systems. Therefore, under the memoryless binary symmetric channel (MBSC) assumptions, the performance evaluation or estimation schemes for digital signal 1 (DS1) transmission systems carrying live traffic is an interesting and important problem. This study will present some analytical methods, leading to efficient detecting algorithms of burst error using cyclic redundancy check (CRC) code. The definition of burst error is introduced using three different models. Among the three burst error models, the mathematical model is used in this study. The probability density function, function(b) of burst error of length b is proposed. The performance of CRC-n codes is evaluated and analyzed using function(b) through the use of a computer simulation model within CRC block burst error. The simulation result shows that the mean block burst error tends to approach the pattern of the burst error which random bit errors generate. GRA

N92-27784# Naval Postgraduate School, Monterey, CA.
THE COAST GUARD'S VHF-FM NATIONAL DISTRESS SYSTEM: ANALYSIS FOR RECAPITALIZATION M.S. Thesis
William C. Glidden Jun. 1991 179 p
(AD-A246040) Avail: NTIS HC/MF A09

Twenty years ago the U.S. Coast Guard established the National Distress System (NDS) of VHF-FM remote-controlled transceivers to provide nationwide maritime distress coverage and Coast Guard C(sup 2) communications. The NDS was designed to provide radio coverage along the coasts, the inland waterways, and the Great Lakes. The current NDS equipment is reaching the end of its useful life and the new requirements placed upon the system have mandated its replacement. In this thesis the author first details the C(sup 2) structure of the Coast Guard and identifies its major missions, and then relates history of the NDS. An examination of the NDS' current configuration is performed, the requirements are identified, and applicable technology is explored. The author concludes that present technology and commercially available equipment is available to solve the present and anticipated requirements placed upon the NDS. The author provides a model of the proposed system and presents an implementation schedule for replacement of the NDS. Author (GRA)

N92-27855# Lee (J. S.) Associates, Inc., Rockville, MD.
TACTICAL COMMUNICATIONS NETWORK MODELLING AND RELIABILITY ANALYSIS: AN OVERVIEW Final Report
James J. Kelleher Nov. 1991 92 p Prepared for Defense Research Technologies, Inc., Rockville, MD
(Contract DAAL02-89-C-0040)
(AD-A245339; JC-2091-GT-F3) Avail: NTIS HC/MF A05

This report summarizes a survey of the literature on network reliability problems that arise in modeling communication networks and includes brief tutorials on the graph-theoretic concepts. Emphasis is placed on mobile communications in which the underlying network topology is subject to wide variations in the local environment, as opposed to network synthesis and design. The analysis of communication networks is primarily based on mathematical theory of graphs and its development of efficient algorithms to take advantage of parallel or concurrent data processing. The main thrust of graph theory in communications is the notion of the connectivity of the graph and this report concentrates on this subject area. GRA

N92-27858# Defence Research Establishment, Ottawa (Ontario).
A SOPHISTICATED CAD TOOL FOR THE CREATION OF COMPLEX MODELS FOR ELECTROMAGNETIC INTERACTION ANALYSIS
Marc Dion, Satish Kashyap, and Aloisius Louie Jun. 1991 57 p
(AD-A245936; DREO-TN-91-16) Avail: NTIS HC/MF A04

This report describes the essential features of the MS-DOS version of DIDEC-DREO, an interactive program for creating wire grid, surface patch, and cell models of complex structures for electromagnetic interaction analysis. It uses the device-independent graphics library DIGRAF and the graphics kernel system HALO, and can be executed on systems with various graphics devices. Complicated structures can be created by direct alphanumeric keyboard entry, digitization of blueprints, conversion form existing geometric structure files, and merging of simple geometric shapes. A completed DIDEC geometric file may then be converted to the format required for input to a variety of time domain and frequency domain electromagnetic interaction codes. This report gives a detailed description of the program DIDEC-DREO, its installation, and its theoretical background. Each available interactive command is described. The associated program HEDRON which generates simple geometric shapes, and other programs that extract the current amplitude data from electromagnetic interaction code outputs, are also discussed. GRA

N92-27864# Mitre Corp., Bedford, MA.
JTIDS ELECTROMAGNETIC COMPATIBILITY IN THE 960-1215 MHz BAND Final Report
Robert S. Lokuta Jan. 1992 142 p
(Contract F19628-89-C-0001)
(AD-A247834; MTR-11135; ESD-TR-91-224) Avail: NTIS HC/MF A07

The Joint Tactical Information Distribution System (JTIDS) operates in the 960-1215 MHz frequency band. This band is allocated world-wide on a primary basis for aeronautical radio navigation. JTIDS was designed to be electromagnetically compatible with the Air Traffic Control systems that operate in this band. Over the past 15 years, extensive bench tests, flight tests, and analyses were conducted to assess the electromagnetic compatibility (EMC) of JTIDS in the 960-1215 MHz band. This report summarizes the results and conclusions of these efforts, presents some supporting data and provides specific guidance for the operation of JTIDS within the National Air Space. Guidance and recommendations are also provided to assist in the definition and scope of a JTIDS EMC test and analysis effort. GRA

N92-27970# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
A NEW COMPOSITE ROUGHNESS SURFACE SCATTERING MODEL Final Report
Gary S. Brown 20 Jan. 1992 6 p
(Contract DAAL03-89-K-0137)
(AD-A248891; ARO-26988.1-GS) Avail: NTIS HC/MF A02

A new rough surface scattering theory which reduces to the composite surface scattering model is developed. It is based on the use of a normalized first order smoothing approximation in conjunction with the proper use of stationary phase to bring out the large scale surface shadowing. The theory provides the basis for improving on the conventional composite model. GRA

N92-28003# Phillips Lab., Hanscom AFB, MA.
CATALOG OF ABSOLUTELY CALIBRATED, RANGE NORMALIZED, WIDEBAND, ELECTRIC FIELD WAVEFORMS FROM LOCATED LIGHTNING FLASHES IN FLORIDA. VOLUME 2: 8 AND 10 AUGUST 1985 DATA Environment Research Papers
Yutaka Izumi and John C. Willett 12 Apr. 1991 310 p
(AD-A248377; AD-E200919; PL-TR-91-2076-Vol-2; ERP-1082-Vol-2) Avail: NTIS HC/MF A14

During the summers of 1985 and 1987, field experiments were conducted at the NASA Kennedy Space Center, Florida, to measure electromagnetic fields produced by lightning. This is the second data report resulting from these experiments. It presents plots of range-normalized waveforms for all offshore located lightning events recorded during two storms on 8 and 10 August 1985. The storms in the first data report occurred on 24 July and 14 August 1985. The events are classified into categories according to the general characteristics of the waveforms. The waveforms presented are the electric field, time derivative of the electric field, and high frequency energy spectral density. GRA

N92-28005# Royal Signals and Radar Establishment, Christchurch (England).
A DIGITAL SATELLITE DELAY SIMULATOR Memorandum Report
R. W. Ashcroft Dec. 1991 13 p
(AD-A248386; RSRE-Memo-4561; DRIC-BR-309631) Avail: NTIS HC/MF A03

This document describes the design and operation of a bidirectional digital satellite delay simulator. The data rates which are catered for are 2400, 3600, 7200, and 16000 bps, but other data rates could be included with only minor modification. The circuit is based on the Motorola 6809 microprocessor which uses the Motorola 6852 synchronous serial data adapter (SSDA) as the interface devices. GRA

N92-28065# Naval Postgraduate School, Monterey, CA.
SURVIVABILITY OF METEOR BURST COMMUNICATION UNDER ADVERSE OPERATING CONDITIONS M.S. Thesis
Mark A. Gates Mar. 1992 75 p
(AD-A248632) Avail: NTIS HC/MF A04

This thesis is a study of the survivability and reliability issues associated with operating meteor burst communication systems under adverse conditions. Meteor burst communication relies on the phenomenon of reflecting radio waves off the ionized trails left by meteors as they enter the atmosphere and disintegrate. The systems' rapid deployment capability, mobility, and operating characteristics make it ideal for disaster and emergency communications. Adverse conditions such as ionospheric disturbances, polar region anomalies, sun-spot activity, the nuclear EMP environment and others are discussed. GRA

N92-28066# Texas A&M Univ., College Station. Electromagnetics and Microwave Lab.
RADIATION, SCATTERING, AND GUIDANCE OF ELECTROMAGNETIC FIELDS BY ARBITRARILY SHAPED STRUCTURES EMBEDDED IN LAYERED DIELECTRIC MEDIA Quarterly Progress Report, 1 Jan. - 31 Mar. 1992
K. A. Michalski 31 Mar. 1992 2 p
(Contract N00014-90-J-1197)
(AD-A248951) Avail: NTIS HC/MF A01

We have developed a technique for the computation of the radar cross-section (RCS) of loaded and unloaded microstrip patch antennas of arbitrary shape. We continued research into a related problem of an arbitrarily shaped microstrip patch antenna excited through an iris in a rectangular waveguide. We also continued to make progress in the analysis of three-dimensional microstrip discontinuities and in the analysis of single and coupled integrated dielectric waveguides. GRA

N92-28084# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Electromagnetic Wave Propagation Panel.
ADVANCES IN FIBRE-OPTIC TECHNOLOGY IN COMMUNICATIONS AND FOR GUIDANCE AND CONTROL [TECHNIQUES DE POINTE EN MATIERE DE FIBRES OPTIQUES DANS LE DOMAINE DES COMMUNICATIONS ET POUR LE GUIDANGE ET LE PILOTAGE]
May 1992 175 p Lectures held in Rome, Italy, 18-19 May 1992, in Leiden, Netherlands, 21-22 May 1992, and in Monterey, CA, 26-27 May 1992
(AGARD-LS-184; ISBN-92-835-0673-1) Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Fiber-optics is progressively changing from the research stage to the field of application. However, new possibilities are emerging, which will bring a new revolution in the field of telecommunications, such as coherent transmission, new transmission material transparent to mid-infrared radiation, active fibers, and soliton propagation. Fiber-optics is gaining increasing importance in tactical missile and aircraft guidance and control. This has been driven by the commercial development of fiber optic cable and related components. The requirements for military guidance and control applications are highly demanding for the characteristics of fibers and necessary related components (transmitters, receivers, connectors, etc.). For individual titles, see N92-28085 through N92-28093.

N92-28085# California Inst. of Tech., Pasadena.
SEMICONDUCTOR LASERS AND FIBER LASERS FOR FIBER-OPTIC TELECOMMUNICATIONS
Kerry J. Vahala, Namkyoo Park, Jay Dawson, and Steve Sanders *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 8 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The performance characteristics of state of the art semiconductor lasers for fiber telecommunication systems are reviewed. Modulation speed, intensity noise, single frequency line width, and tunability are addressed. In addition, recent results concerning the same characteristics in single frequency, tunable fiber lasers are reviewed and compared with the semiconductor laser. Author

N92-28086# Fondazione Ugo Bordoni, Rome (Italy).
COHERENT COMMUNICATIONS
G. DeMarchis *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 22 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Coherent lightwave techniques, when compared to direct detection techniques, offer nearly quantum noise limited sensitivity as well as fine tunability similar to that obtained at radio frequencies. These two aspects provide communication systems planners and engineers a means to better exploit the huge bandwidth of single mode optical fibers. Field trials have been performed showing that such techniques are suitable for transmitting multigigabit per second signals to distances exceeding well over a hundred kilometers. On the other hand, coherent multichannel, frequency division multiple access, local area networks have been proposed and experimented with worldwide. This paper will discuss the theoretical advantages and limitations of the various modulation and detection formats together with the state of the art. Moreover some aspects, related to the introduction of coherent systems in local and metropolitan area networks, will be treated. Finally, some experimental data will be provided and future evolution will be discussed. Author

N92-28087# Tetra Tech, Inc., San Diego, CA.
HIGH SPEED LOCAL AREA NETWORKS
H. Hodara and E. Miles *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 12 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Radical changes are taking place in the computer architecture landscape. The big mainframes are being replaced by networks of microcomputers distributed over a wide geographical area. Increases in the speed and memory of computers has created a need for a communication medium capable of transmitting data at a rate exceeding gigabits per second. The low loss, low dispersion optical fiber is the breakthrough that makes high data rate transmission a reality. H.A.

N92-28088# Rome Univ. (Italy). Dipartimento di Fisica.
NONLINEAR EFFECTS IN OPTICAL FIBERS **c74**
Bruno Crosignani *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 20 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The basic differential equations necessary to represent nonlinear propagation of short and ultrashort optical pulses in dielectric waveguides are derived. After introducing fundamental and high-order soliton solutions of the nonlinear Schroedinger equations, the possibilities of realizing soliton-based communication systems are discussed. Higher order nonlinear effects associated with self-Raman gain and optical amplification in connection with the use of active fibers are also described. Author

N92-28089# Southampton Univ. (England). Optoelectronics Research Centre.
ACTIVE FIBRES AND OPTICAL AMPLIFIERS **c74**
David N. Payne *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 26 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The incorporation of rare earth ions into glass fibers to form fiber lasers and amplifiers is not a recent development. However, the fiber laser is only now beginning to receive widespread attention as a possible contender for a well controlled, stable light source for telecommunications, lidar, sensors, and meteorology, despite its obvious advantages of high power pulse operation, single frequency capability, ease of access to the resonator, and compatibility with communications fibers. Much of the current interest stems from the unique ability of the fiber laser to generate high purity soliton pulses of a few picoseconds in duration for potential application in the soliton-based, long haul high capacity communications links of the future. H.A.

N92-28090# McDonnell-Douglas Electronic Systems Co., Santa Ana, CA.
OPTICAL FIBER SENSORS **c74**
Eric Udd *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 18 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Fiber optic sensors are finding increased usage in aerospace guidance and control applications due to their light weight, immunity to electromagnetic interference, high bandwidth and sensitivity, and solid-state, all passive nature. This paper reviews fiber optic sensors with particular emphasis on aerospace applications. Author

N92-28091# Strathclyde Univ., Glasgow (Scotland). Smart Structures Research Inst.
SMART STRUCTURES: THE RELEVANCE OF FIBRE OPTICS **c74**
Brian Culshaw and Peter T. Gardiner *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 17 p (For primary document see N92-28084 18-32)

Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The concept of smart structures integrates structural engineering, sensing, control systems, and actuation to provide a mechanical assembly which is capable of responding to its environment and/or loading conditions. The realization of the smart structure requires integration of skills in a variety of scientific and engineering disciplines ranging from mechanical engineering through materials science into signal processing, data analysis, sensing, and actuation. The sensing technology must have a number of key features of which the ability to take distributed measurements of various parameters throughout the structure is paramount. Fiber optics technology therefore promises to have a significant role to play in the evolution of smart structures concepts. This paper analyzes this role in detail, presents an assessment of the current state-of-the-art in fiber optic technology related to smart structures and presents a scenario for future developments. Author

N92-28092# Photonetics S.A., Marly-le-Roi (France).
FIBER-OPTIC GYROSCOPE **c35**
Herve C. Lefevre and Herve J. Arditty *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 6 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

This paper reviews the technological evolution of the interferometric fiber gyroscope over the last fifteen years. Today a psychological barrier has been passed, and it is now accepted that this new technology will find many applications during the 90's. Author

N92-28093# Litton Industries, Blacksburg, VA. Poly-Scientific Div.
FIBER OPTIC DATA BUSSES FOR AIRCRAFT **c06**
Norris E. Lewis *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 15 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A variety of fiber optic data busses are being developed for aircraft applications. This paper addresses five different data busses under consideration for both military and commercial aircraft. The impact of data bus protocol on component design, the effect of data bus topology on power budget and installation issues, and overall data bus performance are discussed. Author

N92-28100 British Broadcasting Corp., Kingswood (England). Engineering Div.
UHF TELEVISION RECEPTION: GHOST IMAGES FROM VERY LARGE BUILDINGS
D. T. Wright and D. R. Cornell 1992 14 p Original contains color illustrations
(BBC-RD-1992/1) Copyright Avail: BBC, Kingwood Warren, Tadworth, Surrey, England

The problem of ghost images in television picture reception caused by reflection from a very large building is analyzed. For the particular case of the Canary Wharf Tower in London's Docklands, a basic theoretical analysis is compared with field measurements to gain some insight into the factors involved. Possible cures are also discussed. Author

N92-28101 British Broadcasting Corp., Kingswood (England). Engineering Div.
ON MINIMISING NOISE PROBLEMS CAUSED BY PASSENGER LIFTS IN STUDIO CENTRES
C. D. Mathers 1992 12 p
(BBC-RD-1992/2) Copyright Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A number of passenger lifts were investigated as sources of noise and vibration. Typical measured results are presented, and a number of problems and solutions are discussed. Finally, some general recommendations are listed, indicating how noise nuisance may be avoided or remedied. Author

N92-28103# Visidyne, Inc., Burlington, MA.
THE DESIGN, DEVELOPMENT, AND TEST OF BALLOONBORNE AND GROUNDBASED LIDAR SYSTEMS. VOLUME 2: FLIGHT TEST OF ATMOSPHERIC BALLOON LIDAR EXPERIMENT, ABLE 2 Final Report, 30 May 1986 - 31 Dec. 1990
O. Shepherd, R. D. Bucknam, A. G. Hurd, and W. H. Sheehan 1 Jun. 1991 90 p
(Contract F19628-86-C-0105)
(AD-A246727; VI-1707-B-Vol-2; PL-TR-91-2191-Vol-2; AD-E200874) Avail: NTIS HC/MF A05

This is Volume 3 of a three volume final report on the design, development, and test of balloonborne and groundbased lidar systems. Volume 1 describes the design and fabrication of a balloonborne CO2 coherent payload to measure the 10.6 micrometers backscatter from atmospheric aerosols as a function of altitude. Volume 2 describes the Aug. 1987 flight test of Atmospheric Balloonborne Lidar Experiment, ABLE 2. In this volume we describe groundbased lidar development and measurements. A design was developed for installation of the ABLE lidar in the GL rooftop dome. A transportable shed was designed to house the ABLE lidar at the various remote measurement sites. Refurbishment and modification of the ABLE lidar were completed to permit groundbased lidar measurements of clouds and aerosols. Lidar field measurements were made at Ascension Island during SABLE 89. Lidar field measurements were made at Terciera, Azores during GABLE 90. These tasks were successfully completed, and recommendations for further lidar measurements and data analysis were made. GRA

N92-28129# Naval Postgraduate School, Monterey, CA.
THE ELECTROMAGNETIC PULSE ENVIRONMENT AND ITS INFLUENCE ON TACTICAL ELECTRONIC AND COMMUNICATIONS EQUIPMENT M.S. Thesis
Steven J. McGrath Mar. 1992 95 p
(AD-A246754) Avail: NTIS HC/MF A05

The purpose of this thesis is to aid the military communicator in understanding the phenomenon that is known as the electromagnetic pulse (EMP). This thesis includes a brief history and definition of the EMP and a description of the various EMP environments. It also discusses the effects that an EMP can have on exposed electronic components and communications equipment. It provides a description of the major approaches that are used to reduce the harmful effects of an EMP. A discussion of the factors considered in a cost benefit analysis is included for the purpose of establishing cost and benefit considerations relevant to a system's evaluation. The thesis concludes that the decision of whether or not to protect electronic and communications equipment from an EMP depends on many factors, including the criticality of the equipment's mission and the cost of EMP hardening compared to the benefits received. It also concludes that the nation should maintain its EMP hardening effort for critical systems. GRA

N92-28134# Naval Postgraduate School, Monterey, CA.
INMARSAT COMMUNICATIONS SYSTEM: A SYSTEMS APPROACH M.S. Thesis
Aristides I. Fasoulas Jun. 1991 160 p
(AD-A246820) Avail: NTIS HC/MF A08

This study describes the history of satellite communications from its beginning to the current date and explains the major components of satellite communications. It describes the satellite communications technology, and identifies some of its problems such as speech echo, data transmission, and digital network synchronization. It deals with U.S. military and international satellite communications systems, and especially with Inmarsat. It also presents the possible threats for a satellite communications system and discusses how to deal with them. Finally, it introduces some conditions and technical considerations of the Inmarsat system in

the Hellenic environment and provides some basic information for choosing a satellite system from an economic point of view.
GRA

N92-28187*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
A COMMUNICATIONS MODEL FOR AN ISAS TO NASA SPAN LINK
James L. Green, Robert E. McGuire, and Brian Lopez-Swafford (Science Applications Research, Lanham, MD.) Jan. 1987 21 p
(NASA-TM-107936; NAS 1.15:107936; NSSDC/WDC-A-R/S-87-09) Avail: NTIS HC/MF A03

The authors propose that an initial computer-to-computer communication link use the public packet switched networks (PPSN) Venus-P in Japan and TELENET in the U.S. When the traffic warrants it, this link would then be upgraded to a dedicated leased line that directly connects into the Space Physics Analysis Network (SPAN). The proposed system of hardware and software will easily support migration to such a dedicated link. It therefore provides a cost effective approach to the network problem. Once a dedicated line becomes operation it is suggested that the public networks link and continue to coexist, providing a backup capability.
H.A.

N92-28024*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DUAL FREQUENCY ALONG-TRACK INTERFEROMETRY Status Report
R. E. Carande, R. M. Goldstein, Y. Lou, T. Miller, and K. Wheeler *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 109-116 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28025*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POLARIZATION SIGNATURES FOR ABANDONED AGRICULTURAL FIELDS IN THE MANIX BASIN AREA OF THE MOJAVE DESERT
Terrill W. Ray (California Inst. of Tech., Pasadena.), Tom G. Farr, and Jakob J. vanZyl *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 117-125 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28029*# Sheffield Univ. (England).
SAR CALIBRATION AND PRINCIPAL COMPONENT ANALYSIS
S. Quegan and L. V. Dutra (Instituto de Pesquisas Espaciais, Sao Paulo, Brazil) *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 138-146 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28030*# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (Germany, F.R.). Inst. for Radio Frequency Technology.
RESULTS OF THE 1989 SAR CALIBRATION EXPERIMENT AT OBERPFAFFENHOFEN
M. Zink *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 147-156 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28031*# Massachusetts Inst. of Tech., Cambridge. Electronics Research Lab.
EXTERNAL CALIBRATION OF POLARIMETRIC RADARS USING POINT AND DISTRIBUTED TARGETS
S. H. Yueh, J. A. Kong, and R. T. Shin *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 157-166 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28032*# Michigan Univ., Ann Arbor. Radiation Lab.
CALIBRATION OF A POLARIMETRIC IMAGING SAR
K. Sarabandi, L. E. Pierce, and F. T. Ulaby *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 167-176 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28033*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INFORMATION CONTENT OF POLARIMETRIC SAR DATA
Ian G. Cumming, David L. Small (British Columbia Univ., Vancouver.), and Jakob J. vanZyl *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 177-186 Sponsored by the Province of British Columbia Science Council GREAT Award Program and the Canadian Natural Sciences and Engineering Research Council (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28034*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE AIRSAR IMAGE BROWSE SYSTEM
A. Pang, L. Nguyen, and R. Kwok *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 187-194 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28035*# Commission of the European Communities, Ispra (Italy). Inst. of Remote Sensing Applications-Advanced Technologies.
GEOMETRIC RECTIFICATION AND GEOCODING OF JPL'S AIRSAR DATA OVER HILLY TERRAIN
H. DeGroof, G. DeGrandi, and A. J. Sieber *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 195-204 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

N92-28038*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TOPSAR INTERFEROMETRIC RADAR TOPOGRAPHIC MAPPING INSTRUMENT
Howard A. Zebker *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 230-233 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N92-27204# Naval Postgraduate School, Monterey, CA.
PROCESS-DEPENDENCE OF PROPERTIES IN HIGH THERMAL CONDUCTIVITY ALUMINUM NITRIDE SUBSTRATES FOR ELECTRONIC PACKAGING M.S. Thesis
John H. Cooper Dec. 1991 90 p
(AD-A246429) Avail: NTIS HC/MF A05

Recent advances in high performance electronic devices, such as high speed VLSI's, logic circuits, and high power transistors have produced devices with a higher circuit density that produce a large amount of heat. Aluminum oxide is currently the most commonly used substrate material in microelectronic packaging. However, its low thermal conductivity and high coefficient of expansion have led researchers to investigate other materials. The properties of AlN substrate material compare well with those of

the other substrate materials. In addition to a thermal conductivity up to ten times that of Al2O3, AlN has a coefficient of thermal expansion that is closer to that of silicon. Beryllium oxide has an higher thermal conductivity than AlN, however its coefficient of thermal expansion is significantly higher than that of silicon, and its high toxicity creates handling problems during manufacture that lead to high production costs. GRA

N92-27353# Wright Lab., Eglin AFB, FL. Armament Directorate.
INVESTIGATION OF BATTERY CHARGED CAPACITOR PULSED POWER SYSTEMS FOR ELECTROMAGNETIC LAUNCHER EXPERIMENTS Final Report, Jan. 1990 - Apr. 1991
James B. Cornette Feb. 1992 25 p Presented at the 3rd Symposium on EML, London, England, Apr. 1991
(AD-A247325; WL-TR-92-7007) Avail: NTIS HC/MF A03

Candidate pulsed power systems for electromagnetic launchers constitute two broad categories: rotating machinery and nonrotating devices. Rotating machinery is under development at several institutions around the world. Nonrotating hardware includes capacitors, batteries, and inductors. These, too, are the subject of research programs, but as yet, are much larger than rotating supplies of equal power and energy capability. In 1988, system studies identified several attractive pulsed power systems for electromagnetic launchers. Battery charged capacitor pulsed power systems were among those identified as promising for electromagnetic launcher systems. The basic equations governing the battery charging capacitor sequence, and the capacitor discharge into an electromagnetic launcher are the subject of this report. A battery charged capacitor system powering an electromagnetic launcher has also been built and tested. This experiment validates the system concept with presently available hardware, and also can be used to establish a baseline for evaluation of future systems when technology in capacitor and battery power and energy densities improve. GRA

N92-27366# Lawrence Livermore National Lab., CA.
INVESTIGATION OF POLYISOCYANATES AS SECOND HARMONIC GENERATING MATERIALS
D. S. Soane and S. E. Barry (California Univ., Berkeley.) Nov. 1991 4 p
(Contract W-7405-eng-48)
(DE92-010445; UCRL-CR-109407) Avail: NTIS HC/MF A01

The project was undertaken to investigate the use of polyisocyanates (PICs) as second harmonic generating (SHG) material. Experiments were performed to determine the molecular second order susceptibility, and to fabricate a structure capable of SHG. The experimental results were either inconclusive or negative. Poly(n-hexyl isocyanate) (PHIC) and poly (dioxolane isocyanate) (PSIC) were studied. PHIC was obtained with molecular weights (M(sub n)) of 20,000 and 60,000, with a narrow polydispersity of 1.4. A very limited quantity of PSIC was available, with an undetermined molecular weight and and polydispersity in the range of 3 to 4. DOE

N92-27395# Pacific Northwest Lab., Richland, WA.
THE APPLICATION OF CHAOS THEORY TO AN ALUMINA SENSOR FOR ALUMINUM REDUCTION CELLS
R. E. Williford and C. F. Windisch, Jr. Mar. 1992 60 p
(Contract DE-AC06-76RL-01830)
(DE92-010630; PNL-8042) Avail: NTIS HC/MF A04

Four chaos-related digital signal analysis (DSA) methods were applied to the analysis of voltage and current signals collected from aluminum electrolysis cells. Two separate data bases were analyzed: bench-scale laboratory experiments and a pilot-scale test. The objective was to assess the feasibility of using these types of data and analysis methods as the basis for a non-intrusive sensor to measure the alumina content in the electrolysis bath. This was the first time that chaos theory approaches were used to analyze aluminum electrolysis cells. DOE

N92-27398 Department of the Navy, Washington, DC.
DC UNINTERRUPTED POWER SUPPLY HAVING INSTANTANEOUS SWITCHING FOLLOWED BY LOW IMPEDANCE SWITCHING Patent
Russell E. Hammond, inventor (to Navy), Robert L. Northup, Inventor (to Navy), and Alan G. Shimp, inventor (to Navy) 15 Oct. 1991 9 p Filed 22 Mar. 1990
(AD-D015206; US-Patent-5,057,697; US-Patent-Appl-SN-497374; US-Patent-Class-307-66) Avail: US Patent and Trademark Office

An uninterruptible power supply is provided that incorporates switching circuitry permitting a path for instantaneous DC backup power to be supplied to a voltage-declining primary power supply bus. Once the instantaneous transition is made, battery power is switched to a low impedance path to provide long-term battery power delivery to the bus. At a point where the backup batteries no longer supply useful power to a load, disabling circuitry disconnects the batteries from the load so that excessive draining of the batteries does not result in irreversible battery damage. The uninterruptible power supply of the invention further includes an automatic battery charging circuitry that seeks to maintain the power supply batteries at optimal charge level. To enable an operator to adequately assess battery charge condition, the invention provides battery test circuitry that causes a simulated load to appear at the power supply batteries. Visual representations are then made as to battery status. Author (GRA)

N92-27401# Research Triangle Inst., Research Triangle Park, NC.
INVESTIGATION OF LOW-TEMPERATURE, MULTILEVEL DIELECTRICS FOR APPLICATION FOR RADIATION TOLERANT, SUBMICRON-SCALED IC TECHNOLOGY Annual Report, 1 Jan. - 31 Dec. 1991
R. J. Markunas, G. G. Fountain, and G. Lucovsky 4 Feb. 1992 25 p
(Contract N00014-86-C-0421)
(AD-A246989; RTI/3627/91-A; RTI-83B-3627) Avail: NTIS HC/MF A03

The following report details the progress on ONR contract number N-00014-86-C-0421 during the period from January 1, 1991 to December 31, 1991. This program entails a joint effort between Research Triangle Institute and North Carolina State University. Funding is being provided by the Innovative Science and Technology Office of the Strategic Defense Initiative. The objective of this program is to develop deposited, multilayer dielectric structures for integrated circuit applications requiring reliable radiation tolerant insulators. GRA

N92-27404*# North Carolina Univ., Charlotte. Dept. of Mechanical Engineering and Engineering Science.
MAGNETOSTRICTIVE DIRECT DRIVE MOTORS Final Report
Dipak Naik and P. H. DeHoff 30 Jun. 1992 48 p
(Grant NAG5-1169)
(NASA-CR-190451; NAS 1.26:190451; TR-ME/ES-92-2) Avail: NTIS HC/MF A03

A new rare earth alloy, Terfenol-D, combines low frequency operation and extremely high energy density with high magnetostriction. Its material properties make it suitable as a drive element for actuators requiring high output torque. The high strains, the high forces and the high controllability of Terfenol alloys provide a powerful and challenging basis for new ways to generate motion in actuators. Two prototypes of motors using Terfenol-D rods were developed at NASA Goddard. The basic principles of operation are provided of the motor along with other relevant details. A conceptual design of a torque limiting safety clutch/brake under development is illustrated. Also, preliminary design drawings of a linear actuator using Terfenol-D is shown. Author

N92-27445 Department of the Navy, Washington, DC.
PROCESS FOR MAKING SEMICONDUCTOR-ON-INSULATOR DEVICE INTERCONNECTS Patent
Ronald E. Reedy, inventor (to Navy), Graham A. Garcia, inventor (to Navy), and Isaac Lagnado, inventor (to Navy) 19 Nov. 1991 9 p Filed 13 Jul. 1989

(AD-D015208; US-Patent-5,066,613; US-Patent-Appl-SN-380175; US-Patent-Class-437-200) Avail: US Patent and Trademark Office

A process for developing conductive interconnect regions between integrated circuit semiconductor devices formed on an insulating substrate utilizes the semiconductor material itself for formation of device interconnect regions. A patterned layer of semiconductor material is formed directly on the surface of an insulating substrate. The patterned layer includes regions where semiconductor devices are to be formed and regions which are to be used to interconnect terminals of predetermined ones of the semiconductor devices. After forming the semiconductor material, the regions of the semiconductor material patterned for becoming interconnects are converted to a metallic compound of the semiconductor material. Author (GRA)

N92-27508# Naval Postgraduate School, Monterey, CA.
FREQUENCY, AMPLITUDE, AND PHASE TRACKING OF NONSINUSOIDAL SIGNAL IN NOISE WITH EXTENDED KALMAN FILTER M.S. Thesis
Muhittin Uener Jun. 1991 83 p
(AD-A246928) Avail: NTIS HC/MF A05

This thesis applies extended Kalman filtering to the problem of estimating frequency, amplitude, and phase of a nonsinusoidal periodic signal contaminated by additive white, Gaussian noise. Parameters are estimated up to mth significant harmonic component. It also gives an approach for the case of less than mth significant harmonic components. The estimator will track the signal's fundamental frequency, amplitudes, and phases while these parameters are changing slowly over time. The amplitudes are estimated as if the fundamental frequency estimate is correct; the frequency and the phases of the signal are estimated as if the amplitude estimation is correct. Tracking and the capture behavior of the filter are presented. GRA

N92-27513# Naval Research Lab., Washington, DC.
CORONA INCEPTION VOLTAGE DETERMINATION IN ELECTROACOUSTIC TRANSDUCER AUTOTRANSFORMER Report, FY 1987 - FY 1988
Dean L. Diebel May 1991 19 p
(AD-A247871) Avail: NTIS HC/MF A03

An autotransformer corona inception test circuit has been developed and a prototype has been constructed and demonstrated. Circuit diagrams, component makeup, and component values are presented. Ancillary equipment for the test is identified and recommended, test procedures and precautions are presented, and measured corona inception voltage data and data conclusions, as well as pictorial data are presented for H-core, cup-core, and MPP-core autotransformers. A small but significant percentage of failures in high-power fleet sonar transducers are due to breakdown of electrical insulating or dielectric materials. A physical phenomenon that contributes to these failures is corona (a discharge of electricity caused by ionization of the surrounding medium when the voltage gradient exceeds a certain critical value). The frequency of discharge is above 75 kHz. At high operating voltages, corona occurs before dielectric breakdown but it will, in time, deteriorate insulating materials and cause dielectric failure. GRA

N92-27567# Army Lab. Command, Fort Monmouth, NJ. Electronics Technology and Devices Lab.
LITHIUM RECHARGEABLE CELL WITH A POLYMER CATHODE Final Report, Oct. 1989 - Jan. 1991
Charles W. Walker, Jr. Nov. 1991 35 p
(AD-A247577; SLCET-TR-91-35) Avail: NTIS HC/MF A03

Thin films of electropolymerized poly 3-methylthiophene (PMT) were used as a rechargeable cathode in Li(SO2)3AlCl4 electrolyte. Capacity was superior to porous carbon electrodes of like thickness. Pulse power levels of 2 W cm-2 were achieved, and high rate constant current pulses of four-second duration were reproducible over cycles. Cells could be recharged at potentials below 4.0 V, minimizing the formation of chlorine and thereby diminishing the capacity for corrosion. For a primary cell, greater discharge capacity was obtained with thionyl chloride and sulfuryl chloride electrolytes. Since PMT becomes electrically insulating in the reduced state, this could be used as a built-in safety feature to avert the hazards associated with abuse over-discharge. GRA

N92-27639# McMaster Univ., Hamilton (Ontario).
HIGH SPEED INTERDIGITAL MSM PHOTODIODES Ph.D. Thesis
Richard John Seymour Sep. 1989 156 p
(ISBN-0-315-57980-3; CTN-92-60456) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

A fast, simple photodetector which is compatible with optical integration techniques can be produced using a design consisting of an interdigital metal - semiconductor - metal (MSM) photodiode. The general operation of these devices is discussed with emphasis placed on basic device characteristics such as current - voltage, capacitance - voltage, and steady-state and pulsed light response. A two dimensional finite difference model, based on Poisson's equation and the continuity and current equations for semiconductors, was developed to allow numerical analysis of interdigital photodiodes. Experimental interdigital MSM photodiodes were fabricated on three sample materials: semi insulating GaAs, epi-layer GaAs, and silicon-on-sapphire. The photoresponse was measured as a function of wavelength and was discussed as a function of photon absorption. The results showed interdigital photodiodes can operate in wavelength regions where the absorption coefficient is very large and most standard junction diodes exhibit a large reduction in photoresponse. Measurement of the absolute resistivity confirmed the existence of a gain mechanism at high bias voltages as reported by other authors. CISTI

N92-27656# Raytheon Co., Lexington, MA. Research Div.
MINIATURE MICROWAVE FREQUENCY MULTIPLEXERS Final Report, 11 Jul. 1988 - 11 Sep. 1989; 27 Feb. 1990 - 30 Sep. 1991
B. Erfany, K. Simon, and M. Schindler 31 Dec. 1991 106 p
(Contract N00014-88-C-2206)
(AD-A246032; Ray/RD/S-4705) Avail: NTIS HC/MF A06

A novel frequency multiplexer has been developed which divides the 6-18 GHz band into 8 equal size sub-bands. The multiplexer consists of seven diplexers, each of which was realized as an individual monolithic microwave integrated circuit (MMIC). Two prototype multiplexers were assembled and evaluated. The diplexers take advantage of a novel filter design approach. In this approach, conventional lumped element filters define the basic filter shape. In addition, transversal filter elements are integrated, and serve to sharpen the band edge rejection characteristics. These transversal elements are realized with active mode metal-semiconductor field-effect transistors (MESFETs). A low order, MMIC filter using lumped and transversal elements has been demonstrated. This filter, described in Appendix A, has low pass band loss and high signal rejection near its pass band edges. The use of transversal elements reduced pass band loss and increased the filter rejection out of band. In addition, the filter was of moderate complexity and fabricated as an MMIC. These qualities merit further study of lumped/transversal filters for use as diplexer building blocks. This diplexer would be used in the output stage in a high pass/high pass, low pass/low pass multiplexer configuration. GRA

N92-27662# Defence Research Establishment, Ottawa (Ontario).
INVESTIGATION OF ALPHA PARTICLE INDUCED SINGLE-EVENT UPSETS IN CHARGE-COUPLED DEVICES
Gary T. Pepper and Andrew Fechete Dec. 1991 50 p
(AD-A246268; DREO-1114) Avail: NTIS HC/MF A03

The mechanisms for generation of single-event upsets (SEUs) in a linear charge coupled device (CCD) were studied through irradiation with monoenergetic 5.48 MeV alpha particles from a very low flux Am source. Spatial correlation (cluster analysis) of

soft errors due to single alpha particle hits was demonstrated to be a necessary prerequisite for quantitative analysis of different SEU error-generating phenomena. The Texas Instruments TC-103 virtual phase CCD used in this study is shown to be sensitive to alpha particles not only in the vicinity of photosites as expected, but also in the transport CCDs. This latter effect may have adverse consequences for applications employing CCDs as position-sensitive ionizing radiation detectors. The techniques developed in this work for the analysis of one dimensional arrays is readily extensible to two dimensional CCD arrays. GRA

N92-27759# Scientific Research Associates, Inc., Glastonbury, CT.
PHENOMENA UNIQUE TO SUB-MICROMETER DEVICES Final Report, 1 Aug. 1991 - 10 Feb. 1992
H. L. Grubin, T. R. Govindan, B. J. Morrison, and F. J. DeJong 13 Feb. 1992 59 p
(Contract DAAH01-91-C-R184)
(AD-A246655; R92-930033F) Avail: NTIS HC/MF A04

An algorithm developed to solve the time dependent Liouville equation in the coordinate representation was implemented to examine phenomena unique to submicron structure. Quantum transport of electrons and holes in III-V and II-VI resonant tunneling structures was investigated. Attention was focused on the tunneling in and out of quantum wells by both electrons and holes. It was determined that characteristic transients including tunneling and capacitive contributions was of the order of one picosecond. GRA

N92-27785# Naval Postgraduate School, Monterey, CA.
ADAPTIVE DIGITAL NOTCH FILTERING M.S. Thesis
Kaluri V. Rangarao Sep. 1991 102 p
(AD-A246043) Avail: NTIS HC/MF A06

The problem of narrow band interference while transmitting broad-band signals like Direct Sequence Spread Spectrum is a common source of problems in Electronic Warfare. This can occur either due to intentional jamming or due to unavoidable signal sources present in the vicinity of the receiver. Lack of improper information on these narrow band interferers makes it difficult to cancel them. In this thesis the above problem is addressed by using an adaptive notch filtering technique. Before adopting such a technique other methods like the Least Square Estimator and the Maximum Likelihood Estimator were explored. However the Kwan and Martin adaptive notch filter structure was found both relevant and suitable for the problem of interest. The Kwan and Martin method has the difficulty of increasing hardware complexity with number of notches. This makes it difficult to implement in real time. A new algorithm was developed for the purpose of implementing the structure in real-time. This new algorithm offers the same performance at reduced hardware complexity. This algorithm was simulated and the results were presented. A hardware feasibility is discussed by proposing a simple structure based upon existing commercial signal processing chips. Author (GRA)

N92-27840# California Univ., Davis. Dept. of Chemistry.
APPLICATION OF THE A.C. ADMITTANCE TECHNIQUE TO DOUBLE LAYER STUDIES ON POLYCRYSTALLINE GOLD ELECTRODES
W. R. Fawcett, Zuzana Kovacova, Arthur J. Motheo, and Colby A. Foss, Jr. 24 Feb. 1992 26 p
(Contract N00014-90-J-1235)
(AD-A247108; TR-21) Avail: NTIS HC/MF A03

A detailed examination of the dependence of the a.c. admittance of a cell containing a polycrystalline gold electrode has been made in the double layer region as a function of d.c. potential, a.c. frequency, and electrode history. It is shown that the interfacial impedance of a gold electrode with a carefully prepared surface can be treated under these circumstances as a constant phase element when it is in contact with an aqueous solution containing 0.05 M KClO4. Analysis of the frequency dependence of the cell impedance gives the surface inhomogeneity parameter n which turns out to be very close to unity. Although the electrode surface is only slightly inhomogeneous on a microscopic scale, a very large frequency dispersion of the impedance is observed experimentally. A method of estimating the true specific capacity of the electrode is presented, and conditions for carrying out the experiments in a reproducible manner are discussed. GRA

N92-27847# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
SILICON-ON-INSULATOR PHOTONICS Final Report, Jun. 1989 - May 1991
Andrew L. Robinson and Russell Watts Dec. 1991 114 p
Prepared in cooperation with Univ. of Michigan, Ann Arbor, MI
(Contract F30602-88-D-0025)
(AD-A247957; RL-TR-91-372) Avail: NTIS HC/MF A06

The purpose of this investigation was to demonstrate a capability to integrate micro-machining techniques with SOI technology for the fabrication of optical waveguide structures that can be controlled electro-mechanically. A significant part of this effort was devoted to the experimental development of a process sequence for the fabrication of some representative structures that are described in this report. We also present, supported by modeling, a discussion of electro-mechanically induced optical effects as they relate to two particular structures: a silicon cantilever beam and a silicon bridge. Emphasis is focused on the transformation of optical waveguiding properties due to elastic deformation of these structures for purposes of switching and transduction. Author (GRA)

N92-27861# Naval Postgraduate School, Monterey, CA.
THE USE OF ELECTRICAL TRANSMISSION LINE THEORY TO PREDICT THE PERFORMANCE OF SPACECRAFT RADIATORS M.S. Thesis
Steven M. Smith Mar. 1992 137 p
(AD-A247786) Avail: NTIS HC/MF A07

The cascade algorithm that is used for extended surface analysis depends on a new parameterization called the thermal transmission matrix to represent a single fin. This thermal transmission matrix, which is intended to replace the more familiar fin efficiency as a design and analysis parameterization, is a linear transformation that maps conditions of heat flow and temperature at the fin tip to heat flow and temperature conditions at the fin base. The cascade algorithm was derived by resorting to an analogy between a fin and the electrical transmission line. The cascade algorithm permits a fin to be subdivided into many subfins each having a thermal transmission matrix and then the individual transmission matrices for each of the subfins can be used, via a simple matrix product to form an overall equivalent thermal transmission matrix for the entire fin. This thesis develops a thermal transmission matrix for the radiating rectangular, trapezoidal, and triangular fins both for the free space and non-free space environments. Test cases have been run and their solutions exactly match those contained in the literature. The thesis concludes with optimization studies for thermal transmission matrix, cascade algorithm, extended surface, cooling fin, radiative fin, longitudinal fin, rectangular fin, trapezoidal fin, and triangular fin. GRA

N92-27869# Lincoln Univ., PA. Dept. of Physics.
THE IMPURITY RELATED STUDIES OF HIGH T(SUB c) SUPERCONDUCTING MATERIALS Report, 1990-1991
Stanley Tsai 1991 12 p
(Contract N00014-89-J-3237)
(AD-A248296) Avail: NTIS HC/MF A03

In the superconductors of oxides, oxygen atoms play a key role of the superconductivity. From the x-ray and neutron diffraction it was known that in the orthorhombic phase the oxygens are ordered along the b axis so as to form a one dimensional Cu-O chain and a disordering of the oxygen vacancies along a axis. It is popularly agreed that the Cu-O chains play an important role in the high Tc superconductivity. The lack of the isotope effect on the superconductivity in Y-Ba-Cu-O compounds may suggest that the pairing mechanism is not a standard electron phonon interaction. According to Anderson (RVB) the hole amplitude drives true electron-pair amplitude via the hole-pair amplitude which has

the same symmetry as a bound electron pair. If so, a sufficient concentration of Cu +3 is required. Varma et.al proposed that the charge transfer exciton Cu 3+O2-yields Cu2+O-is the source of the effective electron-electron attraction. And Mattheis et.al, from their band structure calculations, concluded that the superconducting properties of these oxides are mainly governed by the Cu-3d and O-2p electrons. Chemical doping is one of the practical methods of confirming these proposed models, by knowing the precise locations of the impurities, and their ion structures. GRA

N92-27884# Naval Postgraduate School, Monterey, CA.
A CIRCUIT MODEL FOR TWO-PATH CUTOFF WAVEGUIDE DIELECTRIC RESONATOR FILTERS M.S. Thesis
Gregory A. Miller Mar. 1992 71 p
(AD-A247785) Avail: NTIS HC/MF A04

This thesis describes the development of a CAD circuit model for two-path cutoff waveguide dielectric resonator filters. The model was verified using published data of known designs in X-band waveguide. Results from the model agree very well with experimental data. Also, a method for designing this type of filter is proposed. It makes use of commercially available CAD software. An example of the design procedure is given, along with experimental data obtained from a filter manufactured according to the design. Author (GRA)

N92-27965# Notre Dame Univ., IN. Dept. of Physics.
THEORY OF SEMICONDUCTING SUPERLATTICES AND MICROSTRUCTURES Final Report, 16 Apr. 1984 - 30 Sep. 1990
John D. Dow 1 Mar. 1992 434 p LIMITED REPRODUCIBILITY: Availability: Document partially illegible
(Contract N00014-84-K-0352)
(AD-A248681) Avail: NTIS HC/MF A19

This final report summarizes theoretical work on semi conducting superlattices and microstructures. A focus of the work is a fundamental understanding of deep-level structures of impurities in semiconductors. Probably the most striking results in this area concern IV-VI semiconductors such as PbTe and SnTe, where we have originated the concept of false valence: In on a Te site in SnTe is a (triple) acceptor and has normal valence of -3 with respect to Te. But on a Te site in PbTe, In is a (triple) donor with a false valence of +3 with respect to Te because an In deep p-like one-electron level capable of trapping six electrons crosses the gap as x decreases in Pbl-xSnxTe. This theory predicts that In is a donor in PbTe but an acceptor in SnTe; it argues that in IV-VI semiconductors, impurities often occupy the intuitively wrong site or antisite; it shows that the relevant In occupies Te sites; it explains low doping efficiencies; and it shows promise for explaining solidus curves. This work on InN illustrates how our theory can be useful for the fabrication and doping of new electronic materials. The recent development of high-mobility InN raises the possibility of making UV sensors and even lasers out of this material. We have presented global predictions on the behavior of s- and p-bonded deep levels in InN, Inl-xGaxN, and Inl-xA xN as a means of guiding experiments aimed at doping these materials for use in UV and blue-green optical devices. GRA

N92-27992# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
INTEGRATED OPTICAL PIPELINED POLYNOMIAL PROCESSORS Final Technical Report, May 1985 - Apr. 1989
Carl Verber Dec. 1991 140 p
(Contract F19628-86-K-0133)
(AD-A248573; RL-TR-91-377) Avail: NTIS HC/MF A07

The purpose of this research was to design, fabricate and characterize a high speed integrated optical pipelined polynomial processor capable of evaluating square roots and solving polynomials up to third order. The Horner rule for polynomial evaluation was applied. The fabricated test devices consisted of a line of alternating adder and multiplier gratings deposited on a single chip of LiNb03. Both adder and multiplier gratings were electro-optic. The coefficients of the polynomial to be evaluated were input as voltages to the adder gratings, while the variables were scanned by applying a-ramp voltage to the multiplier gratings. To evaluate square roots, a second order polynomial was solved. The square root device performed approximately as predicted by the design equations. The third order polynomial evaluator, however, did not perform as predicted, due to a design error. This error was corrected and new devices were fabricated. These new devices performed as predicted and also incorporated significant design improvements, based on the test results of the first devices. GRA

N92-28000 Department of the Navy, Washington, DC.
LOW CAPACITANCE FIELD EMITTER ARRAY AND METHOD OF MANUFACTURE THEREFOR Patent
Richard F. Greene, inventor (to Navy) and Henry F. Gray, inventor (to Navy) 15 Oct. 1991 11 p Filed 27 Sep. 1990
(AD-D015225; US-Patent-5,057,047; US-Patent-Appl-SN-589102; US-Patent-Class-445-24) Avail: US Patent and Trademark Office

A method for fabricating field emitter arrays is disclosed. The method uses the substrate as both an emitter tip mold and an insulating layer. A thick single crystal substrate is orientation-dependent-etched on one side to form a plurality of holes having crystallographically sharp apices or a non-crystalline substrate is etched on one side to form a plurality of holes with a high depth-to-width ratio. An emitter layer is deposited on the substrate surface and in the plurality of holes. The remainder of the field emitter array structure is then formed on the opposite side of the substrate using conventional deposition and etching techniques. Once the emitter is formed, the remaining fabrication steps are self-aligning. The field emitter array thus formed exhibits high input impedance at high frequency, making the field emitter array suitable for high frequency uses. GRA

N92-28067# Honeywell, Inc., Bloomington, MN. Sensor and System Development Center.
MONOLITHIC INTEGRATION OF SEMICONDUCTOR AND SUPERCONDUCTOR COMPONENTS Report, 1 Jan. - 31 Mar. 1992
Burgess Johnson 31 Mar. 1992 18 p
(Contract N00014-90-C-0226)
(AD-A248952) Avail: NTIS HC/MF A03

The goal of the program is to develop transistor technology compatible with high transition temperature superconductor technology so that transistor pixel switches can be integrated with YBa2Cu3O7 superconducting microbolometers in the same silicon substrate. A 4 x 4 matrix-addressable superconducting microbolometer array will be delivered at the completion of the program. The linear arrays of microbolometers produced in the Honeywell funded process run of December 1991 were evaluated under the present contract during January to March 1992. The results, summarized in this report, demonstrate that high-Tc superconductor microbolometers on silicon microstructures are extremely sensitive infrared detectors. GRA

N92-28080# Northwestern Univ., Evanston, IL. Dept. of Materials Science and Engineering.
LARGE SECOND-HARMONIC RESPONSE OF C60 THIN FILMS
X. K. Wang, T. G. Zhang, W. P. Lin, S. Liu, and G. K. Wong Apr. 1992 6 p
(Contract N00014-89-J-1848)
(AD-A248957; TR-6) Avail: NTIS HC/MF A02

Second harmonic generation measurements were performed using 1.064 micro pulses provided by a Nd:YAG laser. A bulk second-order susceptibility esu was observed at room temperature, which is about 1.5 times the X2 value of quartz. X2 values in a poling field were studied as a function of temperature; the largest value occurred at a nominal temperature of 140 C where X2 is ten times larger than the room temperature value. GRA

N92-28121# Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.
SCANNING TUNNELING MICROSCOPY OF THE ORGANIC SEMICONDUCTOR ((ETA-C5Me5) 2Ru(1,4-(2(2))-CYCLOPHANE)) (TCNQ)4 Technical Report No. 10, period ending 1 Jan. 1991
Shulong Li, Henry S. White, and Michael D. Ward 26 Feb. 1992 35 p
(Contract N00014-91-J-1927)
(AD-A246848) Avail: NTIS HC/MF A03

Scanning tunneling microscopy studies of the (001) and (010) faces of the molecular semiconductor are reported. STM images of both faces reveal local density of states (LDOS) associated with stacking of TCNQ molecules along the (100) direction in two crystallographically unique stacks. The tunneling current contrast conforms to the tetrameric periodicity of the TCNQ stacks observed in the crystal structure. Each TCNQ column exhibits a tunneling current corrugation repeating at intervals of 'a' that is attributed to tunneling into the conduction band of a antiferromagnetic 2kF charge density wave (CDW) structure. The CDW's also exhibit corrugation, and antiphase modulation, at a/2 with respect to adjacent attacks, consistent with appreciable interstack coulomb interactions and contributions from the magnetic 4kF structure, which based on the tight binding approximation is equivalent to the canonical description. GRA

N92-28130# David Sarnoff Research Center, Princeton, NJ.
HIGH PERFORMANCE YBCO FILMS Report, 24 Sep. 1991 - 31 Jan. 1992
Edgar J. Denlinger 31 Jan. 1992 18 p
(Contract N00014-91-C-0216; ARPA Order 8100)
(AD-A246802) Avail: NTIS HC/MF A03

The following progress report describes HTS sample characterization techniques that were developed during this period for both the high microwave frequency range and for low frequencies below 1 GHz. For the microwave range, the resonator configuration consists of a cylindrical dielectric resonator probe in direct contact with an HTS sample and surrounded by a cylindrical metal (non-HTS) shield. The technique will be used for the nondestructive testing of HTS films on dielectric substrates with very large areas. Furthermore, it probes the quality of the HTS thin film over a small selective area with high resolution of the surface resistance. It has the ability to measure surface resistance at least an order of magnitude better than gold at millimeter wave frequencies. Our current set up is suitable for substrate diameters up to 5 cm limited by the size of the cryogenic cooler. For characterization at low frequencies below 1 GHz, we have designed and built self-resonant spirals patterned on HTS samples that require very little substrate area. GRA

N92-28137# Scientific Research Associates, Inc., Glastonbury, CT.
NUMERICAL SIMULATION OF THE FUNCTION OF SCIENTIFIC INSTRUMENTATION FOR MEASURING THE SPEED OF ELECTRON DEVICES Final Report, 1 Sep. 1988 - 28 Feb. 1991
H. L. Grubin, J. P. Kreskovsky, W. R. Briley, G. A. Andrews, and M. A. Osman 13 Feb. 1992 113 p
(Contract F49620-88-C-0113)
(AD-A247006; SRA-R92-910028F; AFOSR-92-0020TR) Avail: NTIS HC/MF A06

Three algorithms, the moment equation, Monte Carlo method, and the quantum Liouville equation algorithms, were used in a program to determine the high speed and high frequency operation of submicron electron devices. For a pseudomorphic high electron mobility transistor, high frequency, small signal, subpicosecond charge density waves were observed to form within the two dimensional electron gas. Large signal operation of the PHEMT indicated that the switching time of the device was governed by the longest relaxation effect, the energy relaxation time, estimated to be longer than two picoseconds. A simple two terminal device configuration was examined. It was determined that measurements of its transient behavior, would expose differences in the key relaxation times governing III-V device behavior, and provide the first direct measurement of nonequilibrium effects in semiconductor devices. GRA

N92-28141# Cornell Univ., Ithaca, NY. School of Electrical Engineering.
MILLIMETER-WAVE QUASI-OPTICAL ARRAYS Final Report, 1 Jan. 1989 - 31 Dec. 1991
Richard C. Compton 18 Feb. 1992 32 p
(Contract DAAL03-89-K-0041)
(AD-A248456) Avail: NTIS HC/MF A03

Individual semiconductor devices can not output the power required for many future millimeter-wave systems. During this three year contract we have investigated an innovative way of coherently combining the outputs of a large number of semiconductor devices as a means of generating high power millimeter-wave signals. The combiner consists of a 2-D array of free running oscillators integrated into radiating antennas. Inter-element coupling in the array acts to lock all the elements together in-phase. Arrays of Gunn diodes and MESFET's have been built and are described. GRA

N92-28167# Naval Postgraduate School, Monterey, CA.
PARASITIC FREE SWITCHED CAPACITOR COMPOSITE OPERATIONAL AMPLIFIERS M.S. Thesis
Ralph C. Raisor Jun. 1991 72 p
(AD-A246258) Avail: NTIS HC/MF A04

In this research, analog active circuits are analyzed and designed using periodic sampling techniques. Switched capacitor networks are the basis of these techniques. A parasitic free switched capacitor network is combined with composite operational amplifiers to facilitate implementation of low sensitivity, wide bandwidth, analog integrated circuits. The resulting designed network is implemented into a finite gain circuit and into a bandpass filter network. The results of these applications are compared with the results obtained from continuous circuits of the same design. GRA

N92-27789*# Southampton Univ. (England). Inst. of Cryogenics.
MAGNETIC SUSPENSION USING HIGH TEMPERATURE SUPERCONDUCTING CORES
R. G. Scurlock *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 507-517 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27790*# Mechanical Technology, Inc., Latham, NY.
EFFECT OF FLUX PENETRATION ON THE LOAD CAPACITY OF PASSIVE SUPERCONDUCTING BEARINGS
Dantam K. Rao *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 519-534 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27793*# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Electrotechnical Developments and Constructions.
THE BEARINGLESS ELECTRICAL MACHINE
J. Bichsel *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 561-573 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27806*# Railway Technical Research Inst., Tokyo (Japan).
CHANGE IN THE COIL DISTRIBUTION OF ELECTRODYNAMIC SUSPENSION SYSTEM
Hisashi Tanaka *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 813-825 (For primary document see N92-27788

18-18)
Avail: NTIS HC/MF A20

N92-27811*# Boeing Aerospace Co., Seattle, WA. Aerospace and Electronics.
BATTERY CARS ON SUPERCONDUCTING MAGNETICALLY LEVITATED CARRIERS: ONE COMMUTING SOLUTION
B. Mike Briggs and Henry Oman *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 895-906 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27813*# Argonne National Lab., IL. Energy Systems Div.
COMPUTATION OF MAGNETIC SUSPENSION OF MAGLEV SYSTEMS USING DYNAMIC CIRCUIT THEORY
J. L. He, D. M. Rote, and H. T. Coffey *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 919-938 Previously announced as N92-12280 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N92-27352# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
FRACTAL IMAGE COMPRESSION OF RAYLEIGH, RAMAN, LIF AND LDV DATA IN TURBULENT REACTING FLOWS Final Report, 30 Sep. 1990 - 29 Sep. 1991
Warren C. Strahle and Jechial I. Jagoda Nov. 1991 32 p (Grant AF-AFOSR-0247-90)
(AD-A246960; AFOSR-92-0088TR) Avail: NTIS HC/MF A03

Experiments and analysis were completed concerning a diagnostic program on a two dimensional subsonic windtunnel with a backward facing step and combustion. Combustibles were introduced as a hydrogen-argon mixture from a porous floor behind the step. Completed were LDV and Raman spectroscopy for mean and rms velocity (two components) and temperature. Analysis used a two equation turbulence model which predicted the gross features of the flow but somewhat underpredicted reattachment length. Two dimensional and three dimensional fractal interpolation techniques were developed for reduction of noise to signal ratio in the complex turbulent flow. New methods of fractal analysis of time series were developed. GRA

N92-27407# Technische Hochschule, Aachen (Germany, F.R.). Inst. fuer Strahlantriebe und Turboarbeitsmaschinen.
EXPERIMENTAL INVESTIGATION OF THE UNSTEADY PRESSURE FIELD AROUND AN OSCILLATING BLADE [EXPERIMENTELLE UNTERSUCHUNG DES INSTATIONAEREN DRUCKFELDES UM EINE SCHWINGENDE SCHAUFEL]
C. Poensgen Jun. 1990 123 p In GERMAN
(Mitt-90-01; ETN-92-90829) Avail: NTIS HC/MF A06

A two dimensional unsteady process for predicting the unsteady pressure distribution around an oscillating blade in homogeneous flow is presented. A data base was developed for the computation process. In order to reduce costs, the experimental building was designed in such a way that the experimental boundary conditions could be reproduced by the computation process. It was shown that the pressure amplitude for an oscillating compressor blade is independent from the oscillating displacement, as long as this is kept small. It appears, for that experimental case, that the influences of rotor wake and of the oscillatory motion on the resulting unsteady pressure field can be linearly superposed in first order of magnitude. ESA

N92-27450# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Propulsion and Energetics Panel.
CFD TECHNIQUES FOR PROPULSION APPLICATIONS [LES TECHNIQUES DE L'AERODYNAMIQUE NUMERIQUE POUR LES APPLICATIONS AUX PROPULSEURS]
Feb. 1992 588 p In ENGLISH and FRENCH The 77th symposium was held in San Antonio, TX, 27-31 May 1991 Original contains color illustrations
(AGARD-CP-510; ISBN-92-835-0659-6) Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The symposium was composed of the following sessions: turbomachinery computations and validations; flow in ducts, intakes, and nozzles; and reacting flows. Forty papers were presented, and they covered full 3-D code validation and numerical techniques; multidimensional reacting flow; and unsteady viscous flow for the entire spectrum of propulsion system components. The capabilities of the various numerical techniques were assessed and significant new developments were identified. The technical evaluation spells out where progress has been made and concludes that the present state of the art has almost reached the level necessary to tackle the comprehensive topic of computational fluid dynamics (CFD) validation for propulsion. For individual titles, see N92-27451 through N92-27490.

N92-27451# Technische Hochschule, Aachen (Germany, F.R.). Aerodynamisches Inst.
COMPUTATIONAL TECHNIQUES FOR SOLVING THE NAVIER-STOKES EQUATIONS
D. Haenel *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 26 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Computational techniques for the solution of the Navier-Stokes equations of compressible flows are addressed. In the first section, the governing equations and their most important approximations are described. A review of computational techniques encloses grid arrangement, conservative discretization, numerical flux formulations, and different methods of solution inclusive multigrid methods. In the last section, the influence of the numerical discretization on the accuracy of Navier-Stokes solutions is briefly discussed. Author

N92-27452# Royal Aerospace Establishment, Farnborough (England). Propulsion Dept.
APPLICATION OF S1BYL2 TO THE AGARD WG18 COMPRESSOR TEST CASES
W. J. Calvert *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 16 p Previously announced as N91-30147 (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

S1BYL2 is an inviscid-viscous blade-to-blade method for calculating the detailed aerodynamics and overall performance of compressor blades. It may be applied either on its own to predict the flow for individual blade sections, such as the midspan of a linear cascade, or in conjunction with a throughflow calculation to predict the performance of a complete axial compressor. New predictions for the V2 and ARL SL19 cascades and for the high speed compressor cases are presented. It is hoped that this will be one of many sets of calculations for these cases, so that an improved understanding of each case may be obtained, together with an appreciation of the strengths and weaknesses of different computational approaches. Author

N92-27453# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mechanical Engineering.
A COMPUTATIONAL STUDY OF TIP LEAKAGE FLOW AND LOSSES IN A LINEAR TURBINE CASCADE
John Moore and Joan G. Moore *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 12 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A computational study of 3-D flow in the Virginia Polytechnic Institute and State University (VPI&SU) tip leakage turbine cascade is used to show the level of modeling attainable now. Results for the overall flow development are compared with measurements of flow and losses at the exit of the tip leakage gap and downstream of the blade row. Mechanisms for the additional loss due to tip leakage are discussed. Consideration is given to areas where the modeling of fine scale flow structure may be improved. These include the flow in the tip clearance gap, flow in the tip leakage vortex, and flow separation at the trailing edge. Author

N92-27454# Genoa Univ. (Italy). Dipartimento di Ingegneria Energetica.
TIME-MARCHING METHODS FOR SECONDARY FLOW ANALYSIS IN CURVED DUCTS
M. Marini, A. Massardo, and A. Satta *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 7 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Compressible rotational flows in curved ducts due to inlet total pressure gradients are analyzed. Two different time-marching methods are briefly presented and utilized for the analysis of the development of 3-D flows. The former is a finite volume explicit method, and the latter is a finite difference implicit method. These methods are successfully compared to each other and with other methods. A first analysis of secondary flows concerning constant section curved ducts with a curvature of 90 degrees is performed. Author

N92-27455# Wright Lab., Wright-Patterson AFB, OH.
TURBINE INTERNAL FLUID FLOW ANALYSIS AND STOKES' HYPOTHESIS
Robert E. Gray and William A. Troha *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 14 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Two dimensional Navier-Stokes solvers are beginning to appear for the purpose of analyzing fluid flow and heat transfer phenomena in turbomachinery. It is often assumed that the Navier-Stokes equations represent the ultimate in precision and generality possible when the fluid is modeled as a continuum. Therefore, the advent of the high-speed computer has spawned a number of finite differencing schemes aimed at solving these equations for steady and unsteady flows, both internal and external. In the case of compressible flows with heat transfer, some of these schemes have had questionable success in the approximation of experimental data despite use of accepted solution techniques and reasonable care in maintaining rigor in boundary conditions. Stoke's hypothesis, with its implication of zero bulk viscosity for a viscous fluid, may have a bearing on some of these anomalies. Two viscous, compressible flow phenomena, in the form of expansion waves, for which the level of irreversibility implied by Stoke's hypothesis appears to be suspect. Author

N92-27456# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany, F.R.). Inst. fuer Antriebstechnik.
COMPUTATION OF 3D-VISCOUS FLOW AND HEAT TRANSFER FOR THE APPLICATION TO FILM COOLED GAS TURBINE BLADES
Thorsten Vogel *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 12 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The mechanism of film cooling and heat transfer on gas turbine blades and end walls is theoretically investigated by simultaneously solving the 3-D Navier-Stokes equations for the flow field and the 3-D heat conduction equation for the cooled blade. The coupling of flow calculation and heat conduction calculation in the turbine blades supplies the wall temperatures and heat fluxes at the blade surfaces. These have to be taken from measurements if a traditional boundary layer approach is used for calculating the corresponding heat transfer coefficients. Heat transfer coefficients and film cooling efficiencies resulting from the 3-D solution are presented. Additionally, a comparison between measured and calculated data is shown. Author

N92-27457# Durham Univ. (England). School of Engineering and Applied Science.
EXPERIMENTAL VERIFICATION OF A 3D TURBULENT FLOW CALCULATION IN AN AXIAL TURBINE CASCADE
J. G. E. Cleak, D. G. Gregory-Smith, and N. T. Birch (Rolls-Royce Ltd., Derby, England) *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 15 p Sponsored in part by Rolls-Royce Ltd. and Science Research Council (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A Navier-Stokes computer code was used for the calculation of the 3-D secondary flow in a cascade of axial turbine blades. A comparison is made with experiment of the results of various applications of a mixing length model within the code. The results are compared on the basis of mean flow data and also turbulent Reynolds shear stresses. Substantial grid independence was obtained with a grid of 20,000 points; further grid refinement had a significant effect only on midspan loss. Large variations in the results were obtained with laminar flow being imposed for up to 80 percent of the axial chord away from the end wall. The high turbulence activity in the vortex core was not predicted; the flow close to the endwall and blade surfaces appeared to dominate the calculated flow. The need for higher order turbulence modeling is indicated, but probably of greater importance is the accurate prediction of transition. Author

N92-27458*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A MATHEMATICAL CONSTRAINT PLACED UPON INTER-BLADE ROW BOUNDARY CONDITIONS USED IN THE SIMULATION OF MULTISTAGE TURBOMACHINERY FLOWS
J. J. Adamczyk *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 8 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A number of researchers have suggested using an inter-blade row boundary condition to extend isolated blade row flow solvers to multiple blade row configurations. This suggestion is worth consideration for it appears to result in codes that are computationally more efficient than those based on other schemes that were suggested to accomplish the same task. The work is concerned with the development of a mathematical constraint which this boundary condition must satisfy to insure the proper transfer of momentum and vorticity across the plane. Using experimental data, the work quantifies the error in the time-averaged vorticity field which results from simply requiring continuity across the boundary plane of the momentum based on the time-averaged velocity fields associated with a multiple blade row configuration. Author

N92-27459*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

A CRITICAL EVALUATION OF A THREE-DIMENSIONAL NAVIER-STOKES METHOD AS A TOOL TO CALCULATE TRANSONIC FLOWS INSIDE A LOW-ASPECT-RATIO COMPRESSOR

Chunill Hah and Steven L. Puterbaugh (Air Force Systems Command, Wright-Patterson AFB, OH.) *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 14 p Original contains color illustrations (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A numerical study to evaluate a three-dimensional Navier-Stokes method as a tool to predict the detailed flow field inside a low-aspect-ratio compressor at various operating conditions was conducted. The details of the flow structure inside a low aspect ratio compressor (three-dimensional shock structure, shock-boundary layer interaction, and tip leakage vortex) and the overall aerodynamic performance at design and off-design conditions are numerically analyzed and the results are compared with the available experimental data. The flow field inside a state-of-the-art transonic compressor is used for the purpose of the evaluation. D.R.D.

N92-27460# Paris VI Univ. (France).

ON THE COMPUTATION OF UNSTEADY TURBOMACHINERY FLOWS. PART 1: EULER EQUATIONS IN VIBRATING CASCADES

Georg A. Gerolymos *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 19 p Sponsored in part by SNECMA (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A methodology is presented for unsteady flow analysis in vibrating transonic compressor cascades, using Euler equations. After a brief discussion of the problem, the numerical algorithm is presented, for the 3-D case, with particular emphasis on grid displacement procedures, slip surface fitting, boundary conditions, and their effect on computational results. Chorochronic flow periodicity and model superposition are briefly discussed. Several results from realistic aircraft engine turbomachinery configurations are presented. The lack of, and urgent need for 3-D experimental data combining unsteady pressure measurements and vibrating mode shapes are stressed. The methods are then validated through comparison with time linearized flat plate cascade theory (analytical) and experimental data from annular and linear cascades. A method for computing the aeromechanical coupling is presented. Finally, a discussion is presented of viscous effects. Author

N92-27461# Textron Lycoming, Stratford, CT.

APPLICATION OF CFD IN THE DESIGN OF GAS TURBINE ENGINE COMPONENTS **c07**

Arun K. Sehra, Mohamed A. Abolfadl, and Mohamed G. Zedan *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 26 p (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The application is illustrated of three dimensional viscous procedures for optimizing the turbomachinery component geometry. Specific cases presented include the application of 3-D viscous analyses to a transonic axial compressor rotor, a splittered axial compressor rotor, a turbine rotor, and an exhaust mixer nozzle. Application of an axisymmetric Navier-Stokes solver to the inlet particle separator, and a two dimensional inverse design procedure for customizing compressor airfoil geometry are also briefly included. Author

N92-27462# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

VALIDATION OF A CANARI CODE BY THE COMPUTATION OF THREE DIMENSIONAL TURBULENT FLOW IN TURBINE VALVE [VALIDATION DU CODE CANARI PAR LE CALCUL DE L'ECOULEMENT TRIDIMENSIONNEL TURBULENT DANS UN DISTRIBUTEUR DE TURBINE] **c07**

Beatrice Escande and Laurent Cambier *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 8 p In FRENCH; ENGLISH summary (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The preliminary results are presented which were obtained in order to validate the CANARI code in a turbomachinery case. This code solves the Reynolds averaged compressible three dimensional Navier-Stokes equations. It is applied to the flow computation through a high pressure turbine annular cascade. This computation is characterized by the use of a highly stretched O mesh around the blades and of H meshes for the upstream and downstream regions, in order to allow an accurate description of the leading edge and trailing edge phenomena. The configuration studied is an experimental set-up which has been recently realized at ONERA for the validation of computational codes. Author

N92-27463# Motoren- und Turbinen-Union Muenchen G.m.b.H. (Germany, F.R.).

COMPUTATION AND VISUALIZATION OF SPECIFIC FLOW PHENOMENA IN TURBOMACHINERY APPLICATION **c07**

J. Haarmeyer and B. Stubert *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 8 p (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Capacity and speeds in industrial computer hardware allows the complete numerical evaluation of the three dimensional flow field through turbomachinery blading. Detailed consideration of specific flow phenomena like horseshoe vortex or tip clearance effects is of increasing importance in the engine design process. The large amount of data produced by a 3-D calculation requires separate development of algorithms for visualization of the computational results. Numerical techniques for the integration of both streamlines and vortex lines through 3-D vector fields are needed to identify fluid flow features based on values at discrete grid points. Such an integrated technique is covered and also includes a search algorithm for places of local rotations. Some evaluations of Euler calculations in a turbomachinery application are shown. Author

N92-27464# Vrije Univ., Brussels (Belgium). Computational Fluid Dynamics Group.

AN INTEGRATED CFD SYSTEM FOR 3D TURBOMACHINERY APPLICATIONS **c07**

C. Hirsch, C. Lacor, C. Dener, and D. Vucinic *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 15 p (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A complete CFD system, composed of an interactive mesh generator, an efficient flow solver and an advanced, portable, flow visualization system is presented for turbomachinery applications. The mesh generator (IGG) and the visualization system (CFView) have the same user interface and call on Object Oriented Programming on top of X Windows. The flow solver is developed within a multigrid method, where the time integration schemes are considered as 'smoothers'. Both explicit or implicit time integration methods can be chosen. The explicit integration is based on the Runge-Kutta method and the implicit solver uses relaxation methods with Gauss-Seidel point or line strategies. The space discretization allows for central as well as upwind schemes and algebraic or two equation turbulence models are available. The application to an annular turbine blade row is shown. Author

N92-27465# Electricite de France, Chatou. Dept. Machines.
CALCULATION BY THE FINITE ELEMENT METHOD OF 3-D TURBULENT FLOW IN A CENTRIFUGAL PUMP [CALCUL PAR ELEMENTS FINIS DE L'ECOULEMENT 3D TURBULENT DANS UNE POMPE CENTRIFUGE]
J. F. Combes *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 10 p In FRENCH; ENGLISH summary (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

In order to solve industrial flow problems in complex geometries, a finite element code, N3S, was developed. It allows the computation of a wide variety of 2-D or 3-D unsteady incompressible flows, by solving the Reynolds averaged Navier-Stokes equations together with a k-epsilon turbulence model. Some recent developments of this code concern turbomachinery flows, where one has to take into account periodic boundary conditions, as well as Coriolis and centrifugal forces. The numerical treatment is based on a fractional step method: at each time step, an advection step is solved successively by means of a characteristic method; a diffusion step for the scalar terms; and finally, a Generalized Stokes Problem by using a preconditioned Uzawa algorithm. The space discretization uses a standard Galerkin finite element method with a mixed formulation for the velocity and pressure. An application is presented of this code to the flow inside a centrifugal pump which was extensively tested on several air and water test rigs, and for which many quasi-3-D or Euler calculations were reported. The present N3S calculation is made on a finite element mesh comprising about 28000 tetrahedrons and 43000 nodes. Author

N92-27466# Royal Aerospace Establishment, Farnborough (England).
PREDICTIONS AND MEASUREMENTS OF 3D VISCOUS FLOW IN A TRANSONIC TURBINE NOZZLE GUIDE VANE ROW **c07**
G. C. Horton, S. P. Harasgama, and K. S. Chana *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 16 p Previously announced as N92-14319 (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A transonic turbine nozzle guide vane was tested in an annular cascade with two different endwall geometries. The measurements were taken at engine representative flow conditions and include surface static pressures and a downstream area traverse of total pressure. The flow through these geometries was modeled at the test conditions using a three dimensional viscous flow program. The effects of different mesh densities and two turbulence models were studied. Predictions of secondary flow and loss were obtained and are compared with the experimental measurements. The different turbulence models were found to have little effect in the predicted overall loss though there were differences in the distribution and the shape of the vane wakes. The one equation turbulence model produced wakes which had similar levels of total pressure deficit to the experiment and had a more similar shape than those with the Baldwin-Lomax algebraic model. Author

N92-27467*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
VISCOUS THREE-DIMENSIONAL CALCULATIONS OF TRANSONIC FAN PERFORMANCE
Rodrick V. Chima *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 19 p Previously announced as N92-17346 (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A 3-D flow analysis code was used to compute the design speed operating line of a transonic fan rotor, and the results were compared with experimental data. The code is an explicit finite difference code with an algebraic turbulence model. The transonic fan, called Rotor 67, was tested experimentally at NASA Lewis conventional aerodynamic probes and with user anemometry and was included as one of the AGARD test cases for the computation of internal flows. The experimental data are described. Maps of total pressure ratio and adiabatic efficiency vs mass flow were computed and are compared with the experimental maps, with good agreement. Detailed comparisons between calculations and experiment are made at two operating points, one near peak efficiency and the other near stall. Blade-to-blade contour plots are used to show the shock structure. Comparisons of circumferentially integrated flow quantities downstream of the rotor show spanwise distributions of several aerodynamic parameters. Calculated Mach number distributions are compared with laser anemometer data within the blade row and the wake to quantify the accuracy of the calculations. Particle traces are used to show the nature of secondary flow. Author

N92-27468# United Technologies Optical Systems, Inc., West Palm Beach, FL. Theoretical and Computational Fluid Dynamics Group.
NAVIER-STOKES ANALYSIS OF TURBINE BLADE HEAT TRANSFER AND PERFORMANCE
Daniel J. Dorney and Roger L. Davis *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 12 p (For primary document see N92-27450 18-34)
(Contract N00140-88-C-0677)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A three dimensional Navier-Stokes analysis of heat transfer and aerodynamic performance is presented for a low speed linear turbine cascade. The numerical approach used consists of an alternate direction, implicit, approximate factorization, time marching technique. An objective was to establish the computational grid density requirements necessary to accurately predict blade surface and endwall heat transfer, as well as the exit plane aerodynamic total pressure loss and flow angle distributions. Also, a study was performed to determine a viable implementation strategy for the 3-D modeling of transition and turbulence in the turbine blade passage. Results are presented which show that the present procedure can accurately predict 3-D turbine blade heat transfer as well as the absolute level and spanwise distribution of aerodynamic performance quantities. Author

N92-27469# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
STEADY AND UNSTEADY 3D FLOW COMPUTATION THROUGH A TRANSONIC TURBINE STAGE [CALCULS 3D STATIONNAIRE ET INSTATIONNAIRE DANS UN ETAGE DE TURBINE TRANSSONIQUE] **c07**
Alain LeMeur *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 24 p In FRENCH; ENGLISH summary (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The following problems are discussed. The best approach in order to obtain the average characteristics of the flow field by directly using a three dimensional computation on a complete turbomachinery stage. The real flow is absolutely 3-D and unsteady. This implies that numerical simulation of the flow must be unsteady. Therefore, it is necessary to make more or less rigorous unsteady computation or averaged steady computation can be directly performed. Two different ways to carry out computation on a highly loaded turbine stage are given and analyzed. The steady approach in which the average flow is redistributed at each iteration between both rows, in order to obtain the average steady solution. And the unsteady approach by taking into account several channels on both rows. The computation is purely unsteady with a time periodicity; i.e., if a result is obtained at time t, the same results must be found at time t + T, T being the time period. In these cases, a time average must be made over a period in order to obtain the 3-D flow field average. Author

N92-27470# National Technical Univ., Athens (Greece). Lab. of Thermal Turbomachines.
UNSTEADY EULER CALCULATIONS IN 3D INTERNAL AERODYNAMICS
M. Hadzidakis, F. Karagiannis, P. Chaviaropoulos, and K. D. Papailiou *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 8 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

An implicit finite difference algorithm is presented which solves the unsteady Euler equations in three dimensional ducts. The Helmholtz decomposition is examined of the unsteady velocity field into a potential and a rotational part. The geometry does not change with time, thus the unsteady nature of the flow is due to the time dependent inflow and outflow boundary conditions. The flow at the inlet is supposed to be rotational. Vorticity is introduced by means of velocity, total enthalpy, or even entropy profile slope. The results cover a wide range of reduced frequencies in the subsonic flow regime. Author

N92-27471# Rolls-Royce Ltd., Derby (England).
THE APPLICATION OF A NAVIER-STOKES CFD METHOD TO CIVIL ENGINE INTAKE FLOWS
N. T. Birch, E. H. Kitchen, and R. J. G. Norton (Rolls-Royce, Inc., Atlanta, GA.) *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 10 p Sponsored in part by Ministry of Defence (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Three-dimensional flows around civil engine intakes were calculated by a Navier-Stokes method. The full Reynolds-averaged Navier-Stokes equations for viscous flow are solved by an explicit time-marching cell-centered finite-volume algorithm. To ensure numerical stability, Jameson's formulation of fourth-order and second-order smoothing is used. Second-order smoothing is switched on only in regions of strong pressure gradient such as shocks. The flow may be laminar or turbulent; turbulence is treated by a mixing-length eddy viscosity model. The algorithm is applied on a body-fitted C-type computational grid. Author

N92-27472# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany, F.R.). Military Aircraft Div.
CFD CONTRIBUTIONS DURING HYPERSONIC AIRPLANE INTAKE DESIGN
N. C. Bissinger and A. Eberle *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 24 p Sponsored in part by BMFT (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Above certain Mach numbers, flows in wind tunnels can no longer fully simulate the actual flow physics. In the design of optimal propulsion systems, which are capable of economically propelling aircraft to hypersonic Mach numbers, understanding of the 'real' flow is mandatory. This paper will address recently developed numerical elements of an advanced CFD code in terms of computational speed and accuracy. Results will be presented of several calculations performed to gain insight into the flow in hypersonic intakes. Author

N92-27473# Middle East Technical Univ., Ankara (Turkey).
THREE DIMENSIONAL SOLUTION OF INTERNAL FLOWS USING A CELL VERTEX FINITE VOLUME METHOD
Erdal Oktay, I. Sinan Akmandor, and Ahmet S. Ucer *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 14 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The numerical solutions for internal three-dimensional Euler flows were obtained by using a cell-vertex finite volume method. The solver which was developed, was applied to a wide range of subsonic, transonic, and supersonic test cases, among which, are the Ni-bump channel, the supersonic wedge cascade, and the 90 degree bend channel. A second order accurate, one-step Lax-Wendroff scheme was used to solve the unsteady equations, discretized in strong conservation form. Characteristic boundary conditions were used along with appropriate artificial viscosity and smoothing models. The results illustrate the established flow symmetry in a subsonic Ni-bump channel, the shock - boundary interaction in transonic and supersonic Ni-channels and wedge cascade, and finally, the secondary flow within a 90 degree bend channel. Despite the wide range in the Mach number and the diversity of flow geometries which were tested, close agreement was obtained with available analytical and numerical results associated with these test cases. Author

N92-27474# University Coll. of Swansea (Wales). Dept. of Civil Engineering.
NUMERICAL REPRESENTATION OF HEAT TRANSFER INTO TURBINE BLADE COOLING DUCTS
C. Taylor, J. Y. Xia, J. O. Medwell, and W. D. Morris *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 7 p Sponsored in part by Ministry of Defence and Rolls-Royce Ltd. (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A numerical representation of three dimensional turbulent flow within cooling ducts located in turbine blades and heat transfer into such ducts is effected using the finite element method. The importance of a coupled solid/fluid numerical model, when investigating heat transfer, is demonstrated by comparing numerical results with experimentally determined values relating to smooth, cylindrical rotating passages. Having verified the numerical model, the technique is then used to evaluate heat transfer into a multi-ribbed rotating cylindrical duct. The enhancement of heat transfer, due to Coriolis induced secondary motion and the incorporation of ribs, is predicted and compared with experimental measurements. Author

N92-27475# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PRESENTATION OF A COMPUTATIONAL CODE FOR 3-D COMPRESSIBLE FLOW IN COMPLEX CHANNELS AND CAVITIES [PRESENTATION D'UN CODE DE CALCUL D'ECOULEMENTS COMPRESSIBLES 3-D DANS DES CANAUX ET DES CAVITES DE FORME COMPLEXE]
D. Dutoya, M. Errera, P. J. Michard, and A. Ristori *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 21 p In FRENCH; ENGLISH summary Previously announced in IAA as A91-45650 (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A computation code named MATHILDA was developed at ONERA to study mass and energy transfer through internal cooling systems composed of complex shaped channels and cavities in which the flow is controlled by the interaction between inertial forces and irreversible phenomena. This code integrates the 3D time dependent Navier-Stokes equations, along with some additional transfer equations. The fluid is compressible, and flow may vary from low subsonic to supersonic. The turbulence model can be either a two-equation model or an algebraic model. Author

N92-27476# Instituto Superior Tecnico, Lisbon (Portugal). Dept. of Mechanical Engineering.
VALIDATION OF NON-ORTHOGONAL THREE-DIMENSIONAL LAMINAR FLOW PREDICTIONS
P. J. Coelho and J. C. F. Pereira *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 12 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Most of the flow geometries for aeronautical engineering are complex and cannot be discretized using orthogonal coordinates. In addition, some of those flows can only be described in the fully developed form of the Navier-Stokes equations. In this paper the Navier-Stokes equations are solved for three-dimensional

complex geometries using a non-orthogonal, non-staggered coordinate system. The strong conservation form of the governing equations for laminar flows is discretized using a finite volume method. A numerical grid generation method is employed in order to easily generate the meshes. The flow through a square diffuser, the flow through a transforming duct of elliptical cross-section, and the flow through a square cross-section S-shaped duct were analyzed. The predictions reveal good agreement with the available data demonstrating the accuracy and generality of the present method. The present solution algorithm can easily be extended to calculate subsonic compressible flows. Author

N92-27477# Concordia Univ., Montreal (Quebec).
FINITE ELEMENT SOLUTION OF VISCOUS COMPRESSIBLE FLOWS IN GAS TURBINE DUCTS AND DIFFUSERS
W. G. Habashi, M. F. Peeters, M. P. Robichaud, V.-N. Nguyen, and M. V. Bhat (Pratt and Whitney Aircraft of Canada Ltd., Longueuil, Quebec) *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 11 p Sponsored in part by Pratt and Whitney Aircraft of Canada Ltd.; Natural Sciences and Engineering Research Council of Canada; and Fonds pour la Formation de Chercheurs et l'Aide a la Recherche (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Aerodynamic losses incurred in gas turbine ducting are often substantial, contributing in a significant way to the overall compression or power loss. A finite element Navier-Stokes compressible turbulent code, NS3D, was under development between Pratt & Whitney Canada and Concordia University to help in the understanding of the flow field in such ducts and diffusers, in order to control the loss mechanisms. The code is based on a Newton-Galerkin finite element method, with equal order interpolation for velocities and pressure. The system of linear equations, at each Newton iteration, is solved for the primary variables (u,v,w,p) simultaneously, with either iterative methods designed to run on engineering workstations or with direct methods on supercomputers. Turbulence is modeled through the well-known (k, epsilon) model, with wall functions. The code was applied to the compressible turbulent analysis of intercompressor ducts and diffusers, and compares reasonably well to experiments. In addition, the code is being used to obtain improvement of duct performance through numerical redesign. Author

N92-27478# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany, F.R.). Space Group.
AEROTHERMODYNAMICS OF NOZZLE FLOWS FOR ADVANCED HYPERSONIC PROPULSION SYSTEMS
C. Weiland, G. Hartmann, and S. Menne *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 11 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

One of the major tasks for the development of novel airbreathing space transportation systems, operating from usual airports by horizontal take off and landing, is the integration of an advanced propulsion system in the cell of that spacecraft. The air intake and in particular the free expansion nozzle affect not only the efficiency of the engine but also the forces and moments, and with that, the control of the complete spacecraft. Therefore, it is necessary to know in detail the flow fields through such nozzles and its interaction with the external airflow. Another project deals with conventional rocket motor nozzles whereby injection of turbine exhaust gases in the expansion part of the nozzle the wall of the nozzle is cooled (filmcooling concept) and the thrust is slightly increased. Theoretical investigation of these and other nozzles is the objective of this paper. Euler and boundary layer methods will be applied to predict the flow fields of the nozzles where special emphasis is laid on the consideration of real gas effects. The theory of the Euler method will be described in detail while for the second order boundary layer method the governing equations are presented and the range of its applicability is shortly discussed. Finally results for a variety of nozzles will be given. Author

N92-27479# Technische Univ., Aachen (Germany, F.R.). Inst. for Jet Propulsion and Turbomachinery.
APPLICATION OF FINITE ELEMENT METHOD TO HYPERSONIC NOZZLE FLOW COMPUTATIONS
W. Koschel, W. Rick, and S. Bikker *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 14 p Sponsored in part by DFG (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

An explicit Taylor-Galerkin Finite Element Method (FEM) algorithm, used for the solution of Euler/Navier-Stokes equations, is applied for the computation of steady-state frozen equilibrium flow in single expansion ramp nozzles (SERN) and in plug nozzles for hypersonic propulsion systems. External flow conditions are taken into account. For the determination of nozzle performance a detailed 2D/3D-flow analysis in regions with complex geometries was performed using unstructured computational grids with adaptive mesh refinement. Some results for the investigated nozzle configurations at different flight conditions are presented and discussed. Additionally, thrust vectoring by modification of the lower nozzle flap shape was studied. Author

N92-27480# Manchester Coll. of Science and Technology (England). Dept. of Mechanical Engineering.
COMPUTATIONAL MODELLING OF TURBULENT FLOW IN S-BENDS
N. I. Abou-Haidar, H. Iacovides, and B. E. Launder *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 16 p Sponsored in part by Rolls-Royce Ltd. (For primary document see N92-27450 18-34)
(Contract GR/F/70495)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The paper considers the computation of turbulent flow through circular sectioned S-bends, a flow generically similar to those arising in various types of jet-engine intake ducting. A fully elliptic, finite-volume discretization of the Reynolds equations is adopted. For the main part of the flow the standard algebraic second-moment (ASM) closure is adopted while over the thin, viscosity-affected sublayer, adjacent to the wall, three types of model were explored: namely, one- and two-equation eddy viscosity models and a two-equation ASM closure. Although the main features of the flow development are well captured even with the simplest near-wall treatment, the pressure drop through the second half of the S-bend is seriously underestimated. The successive refinement of the model across the sublayer is found to bring the computed behavior into very close accord with the detailed experimental data. The findings indicate the desirability of using a high-level turbulence model not just in the main part of the flow but across the low-Reynolds-number sublayer also. Author

N92-27481# Aristotle Univ. of Thessaloniki (Greece). Lab. of Fluid Mechanics and Turbomachinery.
THREE DIMENSIONAL FLOW IN SHARP BENDS
K. Fotea, P. Prinos, and A. Goulas *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 12 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The three dimensional flow in sharp bends is computed by solving the fully elliptical three dimensional Navier-Stokes equations in conjunction with a k-epsilon model of turbulence. Computed isovelocity patterns before and after the sharp bend and recirculation lengths are compared with experimental measurements taken with Laser Doppler Anemometry. In general good agreement is obtained although the refinements in the turbulence modelling can improve the predictions. The computational results show that the recirculating region depends

strongly on the inlet velocity profile. Finally, an increase in the aspect ratio of the duct indicates an increase of the region of the recirculation. Author

N92-27482# Motoren- und Turbinen-Union Muenchen G.m.b.H. (Germany, F.R.).
THE 3-D NAVIER-STOKES FLOW AND TEMPERATURE FIELD COMPUTATION FOR A FORCED MIXER NOZZLE
K. Katheder *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 12 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

To increase the temperature mixing efficiency in the common nozzle of an existing turbofan engine, a forced mixer is to be developed. Its design is based on empirically derived knowledge and requires some verification testing. To minimize the scope of testing, a numerical investigation has been performed, computing the complete flow path through the mixer up to the thrust nozzle. The computational domain is formed by a body fitted H-type grid. The simulated air flow is compressible adiabatic including variable specific heat and viscosity and the standard k-epsilon model is used. Resulting velocity and temperature fields are presented together with the temperature mixing efficiency. Use of the velocity field to shape the scallops at the mixer trailing edge is demonstrated. Comparison with test results indicates that computational fluid dynamics (CFD) is a useful engineering tool to check and improve a new design before testing. Author

N92-27483# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany, F.R.). Inst. of Propulsion Technology.
FLOW COMPUTATION IN COMBUSTION CHAMBERS USING ZONAL NONSTAGGERED GRIDS
M. Rachner *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 18 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A Rhie-type nonstaggered grid three dimensional Navier-Stokes Code working on overlaid subdomains by a zonal technique is applied on two model combustion chambers. In the case of the swirling turbulent combustor flow investigated, a locally unrealistic flow behavior at domain boundaries was found on the coarse grid. This is caused by strong overshoots of the momentum interpolated cell mass fluxes, not reported up to now in the literature. The influence of the pressure gradient discretization at boundaries on these overshoots is shown. At inter grid boundaries the discretization of the pressure gradient can give rise to wiggles in the numerical solution as observed in the case of the reacting turbulent crossflow-H2-jet in a rectangular channel. Moreover the influence of fully, partially and lacking local flux conservativity in coupling the numerical fluxes across inter grid boundaries of the subdomain is studied. The fully conservative coupling scheme turned out be a nonrobust method. Author

N92-27484# Rolls-Royce Ltd., Bristol (England). Combustion Technology Dept.
MODELLING THE VAPORISER AND PRIMARY ZONE FLOWS FOR A MODERN GAS TURBINE COMBUSTION CHAMBER **c07**
N. R. Bond, J. M. LeVallois, and K. R. Menzies *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 18 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A three dimensional curvilinear finite volume computational fluid dynamics (CFD) code has been applied to aid understanding of the mechanisms leading to observed baseline temperature patterns on a modern vaporizer combustion chamber. This code calculates recirculating, turbulent, combusting flows with a k-epsilon turbulence model and a conserved scalar/local chemical equilibrium combustion model. Predictions were obtained for both the vaporizer internal flows and for the complete flametube; the latter used the predicted vaporizer exit flow patterns as boundary conditions. The vaporizer flow models displayed a sensitivity to the fuel injector location which was subsequently confirmed by water analogy experiments. In conjunction with the flametube calculations, the effect of injector geometry and location on the primary zone flow patterns and temperatures were assessed, explaining the experimental results. The computational studies suggested a modified fuel injector geometry to reduce sensitivity and improve fuel distribution, which was validated by subsequent experiments in the full combustor. Author

N92-27485# Karlsruhe Univ. (Germany, F.R.). Lehrstuhl und Inst. fuer Thermische Stroemungsmaschinen.
APPLICATION OF MONTE CARLO SIMULATION FOR THREE-DIMENSIONAL FLOWS
M. Scheurlen, B. Noll, and S. Wittig *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 10 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A Monte Carlo technique is outlined for the simulation of the transport of a joint scalar probability density function (PDF). The discretization of the partial differential equations is based on a finite volume approximation. The problem of frozen solutions is addressed if the number of stochastic elements is limited. Non-adiabatic boundary conditions are discussed if the energy equation is solved by a Monte Carlo simulation. The Monte Carlo simulation is compared with deterministic calculations and with an experiment in a three dimensional non-isothermal non-reacting jet mixing flow. The results of the simulation agree very well with the experiment and the deterministic calculations. However, the computer time and storage requirements for a three dimensional simulation of the transport of a single scalar PDF increases dramatically in comparison to deterministic calculations. The results also indicate the need for a simulation procedure that is free of numerical diffusion. Author

N92-27486# Centre National de la Recherche Scientifique, Chatenay-Malabry (France).
THE COHERENT FLAMELET MODEL FOR PROPULSION APPLICATIONS **c25**
D. Veynante, F. Lacas, P. Boudier (Institut Francais de Petrole, Grenoble.), B. Dillies, J. M. Samaniego, T. Poinsot, and S. Candel *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 14 p Sponsored in part by SNECMA and DRET (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

This article reports our recent progress in the modeling of turbulent combustion for propulsion applications. The description of the reactive flow relies on the flamelet concept and uses a transport equation for the flame surface density. The coherent flamelet description which has evolved from a series of numerical and experimental studies is first reviewed and its recent improvements are explained. We then focus on the premixed version of the model. Two applications of relevance to aeronautical propulsion are then described. The first concerns a flame stabilized by a hot stream of combustion products. The second deals with a ramjet configuration comprising two lateral injection jets. In both cases, the model predictions are compared with experiments. It is shown that the model provides viable representations of these two cases. Author

N92-27487# Politecnico di Torino (Italy). Dipartimento di Ingegneria Aeronautica e Spaziale.
NONEQUILIBRIUM 3D FLOWS OF AIR THROUGH INLETS
Roberto Marsilio and Maurizio Pandolfi *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 10 p (For primary document see N92-27450 18-34)
Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The hypersonic nonequilibrium flow of air through inlets of

propulsion devices is investigated. The fluid dynamics is described by the Euler equations and a chemical model accounts for finite rate equations. The numerical procedure is based upon a space marching technique, under the hypothesis of fully developed supersonic flow. The conservative form of the Euler and finite rate chemical equations are integrated, following a finite volume discretization and a flux difference splitting procedure. The numerical scheme is of the second order accuracy, with a proper total variation diminishing (TVD) technique to avoid spurious oscillations at flow discontinuities. Numerical results are presented and discussed. Author

N92-27488# Rome Univ. (Italy). Dipartimento di Meccanica e Aeronautica.

EVALUATION OF THE EFFECTS OF FINITE RATE CHEMISTRY ON NOZZLE PERFORMANCE

M. Onofri *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 11 p (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Predictions of nozzle performance may be strongly affected by the choice of the flow model: large discrepancies with actual behaviors could occur if the two dimensional gasdynamic effects and the variations of chemical composition are not suitably accounted for, especially when the nonequilibrium region is wide enough and two dimensional gasdynamic phenomena interact significantly with chemical kinetics. In order to assess the accuracy of different simulations, a comparison among inviscid numerical solutions is performed for different classes of axisymmetric nozzles. The roles of the two dimensional effects on the global propulsive parameters is analyzed by comparing one and two dimensional solutions, while their influence on chemical kinetics is evaluated by considering frozen and nonequilibrium flow models. The numerical solution of the nonequilibrium nozzle flow model is performed by an implicit integration technique based on an operator splitting between gasdynamics and chemistry. While gasdynamics equations are integrated by the fast solver, the energy and mass fraction conservation equations are integrated in steady form along streamlines with a variable step procedure. This approach yields very efficient and accurate solutions even when the chemical variables display steep gradients. Author

N92-27489# Motoren- und Turbinen-Union Muenchen G.m.b.H. (Germany, F.R.).

NUMERICAL ANALYSIS OF CONVERGING-DIVERGING NOZZLE FLOWS IN CHEMICAL NON-EQUILIBRIUM

R. Walther *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 8 p (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The converging-diverging nozzle geometries, which are presently proposed for hypersonic propulsion systems, are characterized by large expansion area ratios, and by a geometrically variable nozzle throat to control the engine mass flow. Within the expanding nozzle flow, chemical recombination reactions of the combustor exhaust gas products will occur; the limited chemical reaction rates generally leading to a relaxation of the chemical species composition. In addition, changes in mixture composition and heat release due to chemical reactions influence the flow field. Based on Moretti's lambda-scheme a numerical model was developed which couples the gasdynamic phenomena with the chemistry effects that occur within the flow field. The chemical reaction rates are described by a kinetic model involving a satisfactory reaction mechanism. The developed scheme was applied to the expanding nozzle flow of a stoichiometric H2-air exhaust gas. For comparison, four different physical models have been considered to describe the chemical phenomena: chemically frozen flow; flow in chemical equilibrium; chemical equilibrium upstream of nozzle and nonequilibrium downstream of the nozzle; and flow in chemical nonequilibrium. The results are discussed in terms of flow properties, gas mixture composition, and nozzle exit momentum. It is concluded that a physically inadequate model of the chemical phenomena will lead to unacceptable discrepancies in net engine thrust predictions. Author

N92-27490# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

THREE DIMENSIONAL CALCULATIONS OF REACTIVE FLOWS WITHIN AIRCRAFT COMBUSTION CHAMBERS INCLUDING SOME COMBUSTION MODELS [CALCULS TRIDIMENSIONNELS D'ECOULEMENTS REACTIFS DANS LES CHAMBRES DE COMBUSTION AERONAUTIQUES EFFECTUES A L'AIDE DE DEUX MODELES DE COMBUSTION]

Fabienne Pit, Helene Tichtinsky, Pascale Gilbank, and Francis Dupoirieux *In* AGARD, CFD Techniques for Propulsion Applications Feb. 1992 15 p In FRENCH; ENGLISH summary Previously announced in IAA as A92-16089 (For primary document see N92-27450 18-34)

Copyright Avail: NTIS HC/MF A25; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Some three dimensional calculations have been performed in order to predict the reactive flow within aircraft combustion chambers. Two kinds of combustion models have been tested: on one hand a model which makes the assumption of fast chemistry but can however take roughly into account some aspects of the chemical kinetics through an ignition delay and, on the other hand, the Lagrangian-Eulerian PEUL model which can deal directly with some Arrehenius laws by means of the interaction by exchange with the mean (IEM) submodel and hence does not include some assumptions of fast reaction. Author

N92-27529# Naval Postgraduate School, Monterey, CA.

HEAT TRANSFER, ADIABATIC EFFECTIVENESS AND INJECTANT DISTRIBUTIONS DOWNSTREAM OF SINGLE AND DOUBLE ROWS OF FILM-COOLING HOLES WITH COMPOUND ANGLES M.S. Thesis

James M. Wigle Dec. 1991 266 p

(AD-A246531) Avail: NTIS HC/MF A12

Experimental results are presented which describe the development and structure of flow downstream of one row and downstream of two staggered rows of film cooling holes with compound angle orientations. Results presented include distributions of iso-energetic Stanton number ratios, and adiabatic film-cooling effectiveness deduced from Stanton numbers using superposition. Also presented are plots showing the streamwise development of injectant distributions and streamwise development of mean velocity distributions. Spanwise averaged values of the adiabatic film-cooling effectiveness are highest for blowing ratio m = 0.5 and decrease as blowing ratio increases for x/d less than 20. At farther downstream positions, spanwise averaged effectiveness values increase with blowing ratio, except for data obtained downstream of two rows of holes with a blowing ratio of 3.0 and data obtained downstream of two rows of holes with a blowing ratio of 3.0 and data obtained downstream of one row of holes with a blowing ratio of 4.0, where severe lift-off of injectant occurs. Spanwise averaged iso-energetic Stanton number ratios range between 1.0 and 1.4 and show little variation as x/d increases for each value of blowing ratio, however for each x/d, values increases with increasing blowing ratio. GRA

N92-27546# California Univ., Irvine.

FUNDAMENTAL STUDIES ON DROPLET INTERACTIONS IN DENSE SPRAYS Annual Technical Report, 1 Nov. 1990 - 31 Oct. 1991

W. A. Sirgnano, S. E. Elghobashi, I. Kim, and C. H. Chiang 2 Dec. 1991 21 p

(Grant AF-AFOSR-0064-90)

(AD-A246918; AFOSR-92-0100TR) Avail: NTIS HC/MF A03

Computational studies of interactive, vaporizing droplets have been made in order to understand better dynamics of dense sprays. Axisymmetric situations with droplets moving in tandem and three-dimensional situations with droplets moving in parallel have been considered. Detailed velocity and thermochemical properties fields have been determined. Lift and drag coefficients, Nusselt

numbers, and Sherwood numbers for the droplets have been obtained. Correlations of these numbers with instantaneous Reynolds number and transfer number have been obtained. The flow field has been solved by implicit finite-difference solutions of the Navier-Stokes equations. Explanations for the modifications of lift and drag forces, trajectories, and transport phenomena due to droplet interactions have been formulated. Results have been obtained for fuel droplets, especially in high temperature environments, and, to a limited extent, for liquid oxygen (LOX) droplets in a hot, reducing environment. The results, especially the correlations, should prove useful in spray modeling. GRA

N92-27653*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A FAST, UNCOUPLED, COMPRESSIBLE, TWO-DIMENSIONAL, UNSTEADY BOUNDARY LAYER ALGORITHM WITH SEPARATION FOR ENGINE INLETS
Robert L. Roach, Chris Nelson, Barbara Sakowski, Douglas Darling, and Allan G. vandeWall (Case Western Reserve Univ., Cleveland, OH.) Jul. 1992 9 p Proposed for presentation at the 28th Joint Propulsion Conference and Exhibit, Nashville, TN, 6-8 Jul. 1992; sponsored by AIAA, SAE, ASME, and ASEE
(RTOP 505-62-20)
(NASA-TM-105686; E-7065; NAS 1.15:105686; AIAA-92-3082)
Avail: NTIS HC/MF A02

A finite difference boundary layer algorithm was developed to model viscous effects when an inviscid core flow solution is given. This algorithm solved each boundary layer equation separately, then iterated to find a solution. Solving the boundary layer equations sequentially was 2.4 to 4.0 times faster than solving the boundary layer equations simultaneously. This algorithm used a modified Baldwin-Lomax turbulence model, a weighted average of forward and backward differencing of the pressure gradient, and a backward sweep of the pressure. With these modifications, the boundary layer algorithm was able to model flows with and without separation. The number of grid points used in the boundary layer algorithm affected the stability of the algorithm as well as the accuracy of the predictions of friction coefficients and momentum thicknesses. Results of this boundary layer algorithm compared well with experimental observations of friction coefficients and momentum thicknesses. In addition, when used interactively with an inviscid flow algorithm, this boundary layer algorithm corrected for viscous effects to give a good match with experimental observations for pressures in a supersonic inlet. Author

N92-27671# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Fluid Dynamics Panel.
SPECIAL COURSE ON UNSTRUCTURED GRID METHODS FOR ADVECTION DOMINATED FLOWS
May 1992 362 p Special course held in Rhode-Saint-Genese, Belgium, 2-6 Mar. 1992 and at Moffett Field, CA, 28 Sep. - 2 Oct. 1992; sponsored in cooperation with VKI
(AGARD-R-787; ISBN-92-835-0671-5) Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Lecture notes for the AGARD Fluid Dynamics Panel (FDP) Special Course on 'Unstructured Grid Methods for Advection Dominated Flow' have been assembled in this report. The objective of this course was to provide state of the art information, as well as recent developments in unstructured grid methods, suitable for the computation of high Reynolds number compressible and incompressible flows, and other related subjects. A wide range of applications is presented, which includes incompressible free surface problems, transonic aerodynamics, and hypersonic reentry flows. For individual titles, see N92-27672 through N92-27680.

N92-27672# Chalmers Univ. of Technology, Goeteborg (Sweden). Dept. of Mathematics.
FINITE ELEMENT METHODS FOR FLOW PROBLEMS
Claes Johnson *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 47 p (For primary document see N92-27671 18-34)
Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The purpose of this note is to give an overview of the Streamline Diffusion Method (SDM), also referred to as Galerkin/Least Squares or Streamwise Upwind Petrov-Galerkin (SUPG), as a general finite element method for hyperbolic type differential equations modelling convection-diffusion, compressible/incompressible fluid flow or wave propagation. The SDM developed gives the first general solution to the fundamental problem of constructing finite element methods for hyperbolic problems with the desired combination of good stability and high accuracy. The SDM is a modified Galerkin method based on piecewise polynomial approximation with two modifications: a 'streamwise diffusion' modification of the test functions giving a weighted least squares control of the residual of the finite element solution; and the introduction of an artificial viscosity. Author

N92-27673# Stanford Univ., CA. Div. of Applied Mechanics.
FINITE ELEMENT METHODS FOR FLUIDS
Thomas J. R. Hughes *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 22 p (For primary document see N92-27671 18-34)
Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The following topics are covered within this paper: stabilized methods; space-time formulation; symmetric linear advective-diffusion systems; incompressible Euler and Navier-Stokes equations, Stokes problem; compressible Euler and Navier-Stokes equations, entropy variables; nonlinear operators and shock capturing; solution algorithms; and examples. H.A.

N92-27674# Minnesota Univ., Minneapolis. Supercomputer Inst.
FINITE ELEMENT COMPUTATION OF UNSTEADY INCOMPRESSIBLE FLOWS INVOLVING MOVING BOUNDARIES AND INTERFACES AND ITERATIVE SOLUTION STRATEGIES
Tayfun E. Tezduyar *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 45 p (For primary document see N92-27671 18-34)
Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

In these lecture notes we review some of the recent progress on stabilized finite element formulation used in computation of incompressible flows. The stabilization techniques emphasized in these lecture notes are the Galerkin/least-squares, streamline-upwind/Petrov-Galerkin, and pressure-stabilizing/ Petrov-Galerkin formulations. Most of the examples considered are unsteady flow problems, with emphasis on moving boundaries and interfaces, such as free surface flows, liquid drops, flow past an oscillating cylinder, and flow past an oscillating airfoil. Also reviewed are the iteration strategies employed to solve the implicit equation systems resulting from the finite element discretization of these flow problems, including space-time formulations. The lecture notes also describe a new mixed clustered-element-by-element (CEBE/CC) preconditioning method for finite element computations. Author

N92-27675# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). CFD Group.
MULTIDIMENSIONAL UPWIND METHODS FOR UNSTRUCTURED GRIDS
H. Deconinck, R. Struijs, G. Bourgois, H. Paillere, and P. L. Roe (Michigan Univ., Ann Arbor.) *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 17 p (For primary document see N92-27671 18-34)
(Contract AERO-0003-C)
Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

In this contribution we describe a class of upwind schemes for hyperbolic conservation laws on unstructured grids consisting of triangles or tetrahedrons. Unlike standard upwind schemes which

are based on a one dimensional physical model (the Riemann problem), the methods discussed here use a multidimensional physical model for the upwinding. They do not fit in a standard finite volume approach with piecewise continuous representation of the unknowns. In this respect they are much closer to finite element methods based on linear elements, with which they share a continuous piecewise linear representation over the triangles or tetrahedrons. On the other hand they share with standard upwind methods the properties of asymmetric upwinded stencils and control of monotonicity over discontinuities, and they can be considered as truly multidimensional generalizations of the successful TVD upwind methods developed during the eighties. Author

N92-27676*# University Coll. of Swansea (Wales). Dept. of Civil Engineering.

UNSTRUCTURED GRID METHODS FOR COMPRESSIBLE FLOWS

K. Morgan, J. Peraire, and J. Peiro (Imperial Coll. of Science and Technology, London, England) *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 39 p Sponsored in part by Dassault-Breguet Aviation and Rolls-Royce Ltd. (For primary document see N92-27671 18-34)

(Contract NCCw-8; NAGw-478; NAGw-1809)

Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The implementation of the finite element method on unstructured triangular grids is described and the development of centered finite element schemes for the solution of the compressible Euler equation on general triangular and tetrahedral grids is discussed. Explicit and implicit Lax-Wendroff type methods and a method based upon the use of explicit multistep timestepping are considered. In the latter case, the convergence behavior of the method is accelerated by the incorporation of a fully unstructured multigrid procedure. The advancing front method for generating unstructured grids of triangles and tetrahedra is described and the application of adaptive mesh techniques to both steady and transient flow analysis is illustrated. Author

N92-27677*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

ASPECTS OF UNSTRUCTURED GRIDS AND FINITE-VOLUME SOLVERS FOR THE EULER AND NAVIER-STOKES EQUATIONS

Timothy J. Barth *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 61 p (For primary document see N92-27671 18-34)

Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

One of the major achievements in engineering science has been the development of computer algorithms for solving nonlinear differential equations such as the Navier-Stokes equations. In the past, limited computer resources have motivated the development of efficient numerical schemes in computational fluid dynamics (CFD) utilizing structured meshes. The use of structured meshes greatly simplifies the implementation of CFD algorithms on conventional computers. Unstructured grids on the other hand offer an alternative to modeling complex geometries. Unstructured meshes have irregular connectivity and usually contain combinations of triangles, quadrilaterals, tetrahedra, and hexahedra. The generation and use of unstructured grids poses new challenges in CFD. The purpose of this note is to present recent developments in the unstructured grid generation and flow solution technology. H.A.

N92-27678# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). CGD Group.

HIGHER ORDER UPWIND FINITE VOLUME SCHEMES WITH ENO-PROPERTIES FOR GENERAL UNSTRUCTURED MESHES

P. Vankeirsbilck and H. Deconinck *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 54 p Sponsored in part by Avions Marcel Dassault and Belgian National Fund for Scientific Research (For primary document see N92-27671 18-34)

Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

This contribution presents high resolution upwind finite volume schemes based on a polynomial reconstruction of the unknowns on unstructured polygonal cells. The schemes are essentially non-oscillatory (ENO) through the use of an adaptive stencil selection. A complete analysis and comparison given in this text shows that the order of the space accuracy of the schemes is at least equal to the degree of the reconstruction polynomial. Numerical results are shown for a nonlinear hyperbolic conservation equation, confirming the ENO shock capturing and higher order accuracy on highly irregular grids. More realistic Euler calculations will demonstrate the ability of the concepts that are outlined theoretically. Author

N92-27679# George Washington Univ., Washington, DC.

FINITE ELEMENT METHODS IN CFD: GRID GENERATION, ADAPTIVITY, AND PARALLELIZATION

Rainald Loehner *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 58 p (For primary document see N92-27671 18-34)

Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Numerical methods for the solution of field problems using unstructured grids have reached a high degree of maturity. Although computational fluid dynamics (CFD) have been dominated by structured grids, with the increase in computational ability, unstructured grids have started to have an impact on complex geometrical problems in CFD. The following paper describes grid generation, adaptive refinement schemes, visualization and parallelization issues. It also includes a short chapter on CFD among related disciplines that will help the newcomer with flow simulation codes. H.A.

N92-27680# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). CFD Group.

A FRONTAL APPROACH FOR NODE GENERATION IN DELAUNAY TRIANGULATIONS

J.-D. Mueller, P. L. Roe (Michigan Univ., Ann Arbor.), and H. Deconinck *In* AGARD, Special Course on Unstructured Grid Methods for Advection Dominated Flows May 1992 7 p (For primary document see N92-27671 18-34)

Copyright Avail: NTIS HC/MF A16; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

A new algorithm for the generation of the interior nodes for Delaunay triangulation is given. The method uses a background grid to interpolate local mesh size parameters that are taken from the triangulation of the given boundary nodes. Geometric criteria are used to find a set of nodes in a frontal manner. This set is subsequently introduced into the existing mesh, thus providing an updated Delaunay triangulation. The procedure is completed when no more improvement of the grid by inserting new nodes can be achieved. Author

N92-27683# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

AN EXPERIMENTAL STUDY OF HYPERSONIC FLOW DEVELOPMENT IN A PIPE

J. P. Sislian, Z. He, and R. L. Deschambault Aug. 1991 61 p Sponsored by APL and Natural Sciences and Engineering Research Council

(Contract F33615-87-C-2748)

(UTIAS-TN-275; ISSN-0082-5263; CTN-92-60452) Copyright Avail: NTIS HC/MF A04

The structure of supersonic flow in a duct has important implications in the design and operation of wind tunnel diffusers, inlets, and induction systems of hypersonic airbreathing engines. An investigation was conducted to elucidate the structure of the hypersonic flow developed in a circular pipe. Experiments were performed in a hypersonic gun tunnel at a free-jet Mach number

of 8.30 and a Reynolds number based on the pipe diameter of 2.44 million. To visualize the flow over the pipe model, a schlieren photographic system was employed. Wall static pressure, as well as in-stream static and pitot pressure measurements at several sections in the pipe, shed some light into the physical nature of the considered flow. These preliminary measurements indicate that shocks generated in the pipe flow are primarily oblique. Measurements near the pipe axis and in wave structures presented some difficulties. Author (CISTI)

N92-27693# National Research Council of Canada, Ottawa (Ontario). Inst. for Mechanical Engineering.
CALCULATION OF TURBULENT REACTIVE FLOWS IN GENERAL ORTHOGONAL COORDINATES
M. K. Y. Lai Feb. 1992 43 p Sponsored by Dept. of National Defence Original contains color illustrations
(NRC-32128; IME-CFE-TR-001; CTN-92-60492) Avail: NTIS HC/MF A03

The mathematical and numerical methodology for an extended and enhanced version of the TURCOM computer code, called TURCOM-BFC, is presented. This code solves the conservation equations of multi-component chemically reactive and turbulent flows in general curvilinear orthogonal coordinates. The k-epsilon turbulence submodel is used. Flame chemistry assumes a number of species and chemical reactions. The latter are subdivided into finite-rate reaction steps and a one-step irreversible reaction, whose rate is controlled by a combination of mixing and global kinetics. Both the SIMPLE and PISO algorithms are implemented to solve the system of equations. The capability of TURCOM-BFC is tested and demonstrated by predicting 3-dimensional combustion flow inside a reaction furnace, where both polar-cylindrical and bipolar coordinates are used. Author (CISTI)

N92-27757# Purdue Univ., West Lafayette, IN. School of Mechanical Engineering.
TURBULENCE STRUCTURE AND POLYMER DRAG REDUCTION IN ADVERSE PRESSURE GRADIENT BOUNDARY LAYERS Technical Report, 1 Dec. 1990 - 31 Dec. 1991
John E. Koskie and William G. Tiederman Dec. 1991 216 p
(Contract N00014-91-J-1446)
(AD-A246651; PME-FM-91-3) Avail: NTIS HC/MF A10

The ability of some solutions of long chain polymers to greatly reduce the pressure drop in pipes is well documented and commercially applied. In addition, a number of experiments indicate that large reductions of wall friction are possible by injecting polymer into a boundary layer. Therefore, it is reasonable to expect that drag reducing polymers could significantly improve the performance of submersibles when introduced into the boundary layers on the fore and sides of the vessel. However, once polymer is injected at these locations it is unlikely to leave the boundary layer because these polymers have very low mass diffusivities in water and boundary layers continually entrain fluid rather than eject it. As a result, one can expect that drag reducing polymers will be present in the adverse pressure gradient boundary layers on the aft of a vessel whenever the frictional drag on the fore and sides is reduced with polymers. Direct measurements of adverse pressure gradient turbulent boundary layers in which drag reducing polymers are present are not available. However, at fixed speeds, the net drag on a propeller hydrofoil increases while lift decreases when submerged in polymer solution. This apparent increase in form drag suggests a sudden increase in the displacement thickness of the boundary layers which may indicate separation. Therefore, it is necessary to establish whether conditions exist under which turbulent boundary layers of polymer solutions will not separate when they encounter adverse pressure gradients. GRA

N92-27828# Naval Postgraduate School, Monterey, CA.
EFFECTS OF CENTRIFUGAL INSTABILITIES ON LAMINAR/TURBULENT TRANSITION IN CURVED CHANNELS WITH 40 TO 1 ASPECT RATIOS M.S. Thesis
Michael R. Kendall Jun. 1991 306 p
(AD-A246057) Avail: NTIS HC/MF A14

Dean vortices in curved channels with 40 to 1 aspect ratios were measured and studied over the range of Dean numbers from 50 to 450. At low Dean numbers (50), the flow is fully laminar. At higher Dean numbers, the development of vortex pairs as the primary instability was a function of Dean number and the angle of curvature. Higher Dean numbers required less curvature to produce the vortices. At Dean numbers from 75 to 200, secondary instabilities developed in the form of vortex pair modulations, vortex pair twisting, and in the form of events where vortex pair undulations, vortex pair twisting, and in the form of events where vortex pairs appear and disappear. The secondary instabilities are also a function of Dean number and curvature. Twisting leads to increase in longitudinal fluctuating intensities, particularly in the upwash region from the concave wall, which are especially significant at Dean numbers above 150. GRA

N92-27880*# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
A STUDY OF JUNCTURE FLOW IN THE NASA LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL Final Technical Report, May 1990 - May 1992
Ndaona Chokani May 1992 93 p
(Contract NCC1-98)
(NASA-CR-190430; NAS 1.26:190430) Avail: NTIS HC/MF A05

A numerical investigation of the interaction between a wind tunnel sidewall boundary layer and a thin low-aspect-ratio wing has been performed for transonic speeds and flight Reynolds numbers. A three-dimensional Navier-Stokes code was applied to calculate the flow field. The first portion of the investigation examined the capability of the code to calculate the flow around the wing, with no sidewall boundary layer present. The second part of the research examined the effect of modeling the sidewall boundary layer. The results indicated that the sidewall boundary layer had a strong influence on the flow field around the wing. The viscous sidewall computations accurately predicted the leading edge suction peaks, and the strong adverse pressure gradients immediately downstream of the leading edge. This was in contrast to the consistent underpredictions of the free-air computations. The low momentum of the sidewall boundary layer resulted in higher pressures in the juncture region, which decreased the favorable spanwise pressure gradient. This significantly decreased the spanwise migration of the wing boundary layer. The computations indicated that the sidewall boundary layer remained attached for all cases examined. Weak vortices were predicted in both the upper and lower surface juncture regions. These vortices are believed to have been generated by lateral skewing of the streamlines in the approaching boundary layer. Author

N92-27886# Notre Dame Univ., IN. Dept. of Aerospace and Mechanical Engineering.
EXPERIMENTAL INVESTIGATION OF TURBULENCE BEHAVIOR IN SHOCK WAVE/TURBULENT BOUNDARY LAYER INTERACTIONS Report, 1 Oct. 1990 - 30 Sep. 1991
30 Sep. 1991 12 p
(Contract N00014-88-K-0670)
(AD-A247792) Avail: NTIS HC/MF A03

The primary objective of this research is to enhance our understanding of the flow field physics associated with shock wave turbulent boundary layer interactions and thereby enable more accurate predictive models to be developed. It is widely recognized that shock wave turbulent boundary layer interactions are very important in a variety of high speed aerodynamic applications and yet, despite much attention to this topic in the past, the dynamic mechanisms involved remain poorly understood. The compression ramp generated shock wave turbulent boundary layer interaction is experimentally investigated in this study. It is a primary objective of this research to isolate the mechanism(s) responsible for the amplification of turbulent stresses through the shock. The interplay between the combined effects of bulk compression, concave curvature, 'direct' amplification and pressure gradient will be clarified. In addition, the dynamic mechanism(s) responsible for shock wave oscillation and the role this oscillation plays in the turbulent stress amplification through the shock will also be

examined. Measurements documenting the mechanism of turbulent stress relaxation downstream of shock are also obtained. GRA

N92-27918# CFD Research Corp., Huntsville, AL.
PRESSURE-BASED HIGH-ORDER TVD METHODOLOGY FOR DYNAMIC STALL CONTROL Final Report, 1 Jun. - 30 Nov. 1991
H. Q. Yang and A. J. Przekwas 31 Jan. 1992 152 p
(Contract F49620-91-C-0042)
(AD-A247056; AFOSR-92-0015TR) Avail: NTIS HC/MF A08

The quantitative prediction of the dynamics of separating unsteady flows, such as dynamic stall, is of crucial importance. This six-month SBIR Phase 1 study has developed several new pressure-based methodologies for solving 3D Navier-Stokes equations in both stationary and moving (body-comforting) coordinates. The present pressure-based algorithm is equally efficient for low speed incompressible flows and high speed compressible flows. The discretization of convective terms by the presently developed high-order TVD schemes requires no artificial dissipation and can properly resolve the concentrated vortices in the wing-body with minimum numerical diffusion. It is demonstrated that the proposed Newton's iteration technique not only increases the convergence rate but also strongly couples the iteration between pressure and velocities. The proposed hyperbolization of the pressure correction equation is shown to increase the solver's efficiency. The above proposed methodologies were implemented in an existing CFD code, REFLEQS. The modified code was used to simulate both static and dynamic stalls on two- and three-dimensional wing-body configurations. Three-dimensional effect and flow physics are discussed. GRA

N92-27975*# Minnesota Univ., Minneapolis.
AN INVESTIGATION OF THE INFORMATION PROPAGATION AND ENTROPY TRANSPORT ASPECTS OF STIRLING MACHINE NUMERICAL SIMULATION Final Report
Louis F. Goldberg Apr. 1992 52 p
(NASA Order C-22742-P; RTOP 590-13-11)
(NASA-CR-189143; NAS 1.26:189143) Avail: NTIS HC/MF A04

Aspects of the information propagation modeling behavior of integral machine computer simulation programs are investigated in terms of a transmission line. In particular, the effects of pressure-linking and temporal integration algorithms on the amplitude ratio and phase angle predictions are compared against experimental and closed-form analytic data. It is concluded that the discretized, first order conservation balances may not be adequate for modeling information propagation effects at characteristic numbers less than about 24. An entropy transport equation suitable for generalized use in Stirling machine simulation is developed. The equation is evaluated by including it in a simulation of an incompressible oscillating flow apparatus designed to demonstrate the effect of flow oscillations on the enhancement of thermal diffusion. Numerical false diffusion is found to be a major factor inhibiting validation of the simulation predictions with experimental and closed-form analytic data. A generalized false diffusion correction algorithm is developed which allows the numerical results to match their analytic counterparts. Under these conditions, the simulation yields entropy predictions which satisfy Clausius' inequality. Author

N92-27986# Nielsen Engineering and Research, Inc., Mountain View, CA.
A STUDY OF COMPRESSIBLE TURBULENCE Final Report, 1 Jun. - 30 Nov. 1991
D. Nixon, R. E. Childs, L. R. Keefe, and L. C. Rodman 31 Jan. 1992 38 p
(Contract F49620-91-C-0037)
(AD-A247001; NEAR-TR-443; AFOSR-92-0022TR) Avail: NTIS HC/MF A03

This work involves theoretical analyses of turbulence in high speed flow and large eddy simulation results for the mixing layer. Analysis indicates that turbulence is dominated by streamwise vortices as the Mach number approaches infinity. A conceptual model based on swept vortices makes predictions about the sweep angle of these vortices from spanwise at low speeds to streamwise at high speeds, and about the reduced spreading rate at high speeds. Simulations of planar shear layers, started from random initial disturbances, validate these structural predictions. Some interesting characteristics about high speed turbulence have been identified. Shocks are generally rare and weak, even at a convective Mach number of 2.5, because the flow normal to the swept vortices is subcritical. The turbulence kinetic energy is dominated by streamwise fluctuations, while the other energy components are much smaller. The pressure velocity correlations promote weak transfer of energy from the streamwise fluctuations to the other components of energy, and they strongly suppress the shear stress. These statistics are, in general, compatible with the swept vortex structure of turbulence at high Mach number. GRA

N92-28058# Naval Postgraduate School, Monterey, CA.
ENHANCEMENT OF BOILING HEAT TRANSFER IN DI-ELECTRIC FLUIDS M.S. Thesis
Robert A. Egger Sep. 1991 94 p
(AD-A245962) Avail: NTIS HC/MF A05

Direct application of two-phase heat transfer in the liquid cooling of electronic components in fluorinated hydrocarbons (FC-72), is severely inhibited by the excessive amount of superheat required to initiate nucleate boiling. To conduct an experimental study of nucleate pool boiling of FC-72, an experimental test chamber was constructed. This chamber utilized five horizontal platinum wires of 0.05 mm diameter spaced 2.0 cm vertically from each other. The lowest wire was progressively heated from the natural convection region through nucleate boiling, and a study was made on the effects of the boiling wake plume on the heat transfer rate of the upper wires. GRA

N92-28062# Exeter Univ. (England). Dept. of Mathematics.
INSTABILITY AND TRANSITION IN COMPRESSIBLE BOUNDARY LAYERS Final Report, 1 Nov. 1988 - 31 Oct. 1991
Philip Hall 31 Dec. 1991 14 p
(Grant AF-AFOSR-0042-89)
(AD-A248596; AFOSR-92-0214TR) Avail: NTIS HC/MF A03

Results are presented for (1) Real gas effects and Gortler vortices, (2) Nonparallel effects on Gortler vortex growth of Sutherland Law fluids, (3) Secondary instability analysis of finite amplitude Gortler vortices at hypersonic speeds, (4) Effects of crossflow velocities on Gortler vortices, (5) Mode interactions in compressible flows, and (6) Receptivity theory for Gortler vortices. GRA

N92-28175# Cincinnati Univ., OH. Dept. of Aerospace Engineering and Engineering Mechanics.
STEADY AND TRANSIENT ANALYSIS OF FLOWS EXHIBITING STRONG VISCOUS/INVISCID INTERACTION (COMPOSITE RNS PROCEDURES) Final Report, 1 Dec. 1989 - 30 Jan. 1991
Stanley G. Rubin and Prem K. Khosla 31 Jan. 1992 50 p
(Grant AF-AFOSR-0096-90)
(AD-A247171; AFOSR-92-0164TR) Avail: NTIS HC/MF A03

The Reduced Navier-Stokes (RNS) formulation for viscous-inviscid interacting flows with significant upstream or 'elliptic' effects has been applied for transient flows in inlets and steady two and three dimensional flows over cone-cylinder flare, afterbody and channel configurations. The solution technique allows for shock-boundary layer interaction and for regions of axial and secondary flow recirculation. It has been demonstrated that for laminar flows there exists a critical Reynolds number above which the solution exhibits a breakdown. This behavior, which occurs in the region of recirculation and can be correlated with the transition location, is grid dependent and can be missed with insufficiently refined grids or when artificial viscosity is introduced. The pressure-split RNS procedure is a special form of flux-vector splitting that has very favorable properties for sharp shock-shock and shock-boundary layer interaction. A sparse matrix direct solver procedure has been applied for both two dimensional transient flows, and for three dimensional steady flows. A domain decomposition multigrid procedure has further developed for

viscous interacting flows, where significant grid stretching is required in discrete flow regions. GRA

N92-28216# International Centre for Theoretical Physics, Trieste (Italy).
THE STRUCTURE OF MFD SHOCK WAVES IN A MODEL OF TWO FLUIDS
M. Hesaaraki Nov. 1991 31 p
(DE92-622860; IC-91/375) Avail: NTIS HC/MF A03

The mathematical question of the existence of structure of shock waves in a model of two fluids is stated in terms of a four-dimensional system of ordinary differential equations, which depends on four viscosity parameters. By using the Conley theory, we prove that in this model the fast, the slow, the switch-on and the switch-off shock waves always admit structure. However, in the presence of an electrical field, none of the intermediate shock waves possess structure. Some limiting cases for singular viscosity parameters are investigated. In particular, we show how the general results in the classical one fluid MHD theory can be obtained when the plasma viscosity tends to zero. DOE

N92-27317*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
LONG DURATION EXPOSURE FACILITY (LDEF) LOW-TEMPERATURE HEAT PIPE EXPERIMENT PACKAGE (HEPP) FLIGHT RESULTS Abstract Only
Roy McIntosh, Craig McCreight, and Patrick J. Brennan (OAO Corp., Greenbelt, MD.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 114
(For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N92-27385# Sparta, Inc., Lexington, MA.
FOUR-DIMENSIONAL INTERCONNECT EXPERIMENTAL DEVELOPMENT Annual Technical Report, 1 Oct. 1990 - 30 Sep. 1991
Philip D. Henshaw and Steven A. Lis 16 Dec. 1991 35 p
(Contracts F49620-91-C-0002; FQ8671-90-01600)
(AD-A247287; LTR91-018; AFOSR-92-0005TR) Avail: NTIS HC/MF A03

This report summarizes the work performed during the first year of a two year program aimed at demonstrating the feasibility of constructing a 4-dimensional neural network based on the unique properties of spectral hole burning (SHB) materials. The work is progressing as originally planned with the basic optical system nearly complete and tested. The necessary SHB materials have been synthesized and excellent quality holograms have been recorded and retrieved. Both wavelength and angle multiplexing have been demonstrated with no apparent crosstalk. The system design has been precisely defined and all key components have been selected. A discussion is presented describing a set of initial tests which are aimed at verifying the basic operational capabilities of the system. The next phase of complete system integration and testing will soon begin. GRA

N92-27630# Naval Postgraduate School, Monterey, CA.
A DESIGN, FABRICATION AND TEST OF A PRECISION POSITIONING SERVO DRIVE FOR A MULTIPLEXED IMAGING SYSTEM M.S. Thesis
Joseph P. Sargent, Jr. Sep. 1991 99 p
(AD-A246507) Avail: NTIS HC/MF A05

In support of the development of a new initiative in the field of multiplexed image spectroscopy, a high torque, servo system was developed. Utilizing only a low resolution shaft position encoder, the system demonstrated an excellent ability to track a pulse input signal with high precision and stability. Ultimately, this servo system will be incorporated into a new generation of multiplexed imaging and imaging spectroscopy instruments. It will provide those instruments with the capability to accurately rotate into position a sequence of optical image encoding masks and it will tightly control that position, even in the presence of external perturbations. A computer will read the light intensity signals from a sensor and quickly decode the image for viewing and analysis. Further research into this technology should lead to full development of an extremely efficient infrared imaging system, with additional applications to passive surveillance, target signature identification, and airborne infrared astrophysics. Author (GRA)

N92-27823# Department of the Navy, Washington, DC.
DYNAMIC TEST APPARATUS FOR ELECTRO-RHEOLOGICAL FLUIDS Patent Application
Wendell C. Maciejewski, inventor (to Navy) 16 Sep. 1991 14 p
(AD-D015201; US-Patent-Appl-SN-762818; Navy-Case-73480)
Avail: NTIS HC/MF A03

The present invention relates to apparatus for determining the dynamic mechanical properties of an electro-rheological (ER) fluid as a function of frequency, voltage, and temperature. The measured properties can then be used to characterize the effectiveness and behavior of the ER fluids for various engineering applications. Most ER fluid test methods do not allow for property characterization as a function of high frequencies or temperature. The general purpose of the invention is to provide a device that can perform dynamic material measurements of ER fluids over a broad range of temperatures and frequencies and to much higher levels than heretofore employed. Other advantages associated with this invention are that it is economical, simple, easy to manufacture, and easy to clean and operate. The size of the invention may be varied depending on the apparatus used to drive it and any variety of materials could be used to build it. GRA

N92-27857# Naval Coastal Systems Center, Panama City, FL.
PERMEABLE PROLATE SPHEROID IN AN EXTERNAL FIELD: DEMAGNETIZATION AND GRADIOMETER PERFORMANCE
W. M. Wynn Feb. 1992 15 p
(AD-A245932; CSS-TM-567-91) Avail: NTIS HC/MF A03

A permeable prolate spheroid is used as a model for the core of a search coil gradiometer. The performance of the gradiometer is determined by flux concentration and demagnetization due to the core geometry, just as in the case of a search coil magnetometer. Performance curves are given for both magnetometer and gradiometer. GRA

N92-27993# Mission Research Corp., Albuquerque, NM.
THE PARA RADIATION EFFECTS CURRENT SIMULATOR Final Report, 8 Mar. 1990 - 8 Oct. 1991
Bharat Bhuva and Sherra Kerns Jan. 1992 42 p Prepared in cooperation with Vanderbilt Univ., Nashville, TN
(Contract F29601-89-C-0014)
(AD-A248652; PL-TR-91-1071; AD-E200939) Avail: NTIS HC/MF A03

The Parametric Analysis of Radiation effects software development is given the general title PARA. This report describes the development of algorithms and source codes for the simulation of radiation effects on CMOS ICs. The project concentrated on the simulation of total dose effects and the ways to establish/predict the operational lifetime and radiation tolerance of ICs. The switch level simulator incorporates the capability to assign bias dependent post-irradiation drive parameters to transistors within a microcircuit and to calculate propagation delays based on those parameters. This permits test vectors to be assigned based on worst case post-irradiation propagation delays. GRA

N92-28054# Sandia National Labs., Albuquerque, NM.
NONLINEAR ASPECTS OF SHOCK RESPONSE IN ISOLATED ACCELEROMETERS
T. L. Paez and N. Hunter (Los Alamos National Lab., NM.) 1992 10 p Presented at the Institute of Environmental Sciences Symposium, Nashville, TN, 1 May 1992
(Contract DE-AC04-76DP-00789)
(DE92-010827; SAND-92-0517C; CONF-9205127-1) Avail: NTIS HC/MF A02

Numerous investigations have studied the potential for chaotic vibrations of nonlinear systems. It has been shown for many simple nonlinear systems, that when they are excited severely enough, or with the appropriate parametric combinations, they will execute chaotic vibrations. The present investigation considers the potential for the occurrence of chaos in a practical nonlinear system -- the isolated accelerometer. A simple, first order model is proposed for the isolated accelerometer, and it is shown that chaos can occur in the isolated accelerometer. A preliminary investigation into the bearing that this chaos potential has on the measurement of shock response is summarized. DOE

N92-28217# Advanced Mechanical Technology, Inc., Newton, MA.
MODEL A: HIGH-TEMPERATURE TRIBOMETER Final Report, Sep. 1989 - Oct. 1991
Forest J. Carignan Feb. 1992 27 p
(Contract F33615-89-C-2971)
(AD-A249258; WL-TR-91-2124) Avail: NTIS HC/MF A03

A high temperature tribometer has been specifically designed and fabricated to accurately measure, in real time, friction and wear characteristics of materials at temperatures up to 1000 C in a controlled atmosphere. The instrument is capable of three-axis motion control, automated sample load, automated powder and liquid lubrication feed, and computer control of instrument and data acquisition. The tribometer can be run as a stand-alone using the front panels of the tribometer electronic control box or it can be run using the computer. Computer set points can be used as a safety device in case the set parameters go out of bounds. GRA

N92-27312*# Jobin et Yvon S.A., Longjumeau (France).
RULED AND HOLOGRAPHIC EXPERIMENT (AO 138-5) Abstract Only
Francis Bonnemason *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 109 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27328*# Chicago Univ., IL. Lab. for Astrophysics and Space Research.
INSTRUMENTATION FOR NEAR-EARTH MEASUREMENT OF ORBITAL DEBRIS AND COSMIC DUST PARTICLES Abstract Only
Anthony J. Tuzzolino *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 129 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27810*# SatCon Technology Corp., Cambridge, MA.
AN ELECTROSTATICALLY SUSPENDED, MICRO-MECHANICAL RATE GYROSCOPE
Timothy Hawkey and Richard Torti *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 873-892 (For primary document see N92-27788 18-18)
(Contract NAS1-19282)
Avail: NTIS HC/MF A20

N92-28092# Photonetics S.A., Marly-le-Roi (France).
FIBER-OPTIC GYROSCOPE
Herve C. Lefevre and Herve J. Arditty *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 6 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

36 LASERS AND MASERS

Includes parametric amplifiers.
For related information see also *76 Solid-State Physics.*

N92-27354# Stanford Univ., CA. Lab. of Physics.
LASER PHYSICS AND LASER TECHNIQUES Annual Technical Report, 15 Mar. 1990 - 15 Mar. 1991
A. E. Siegman Nov. 1991 81 p
(Contract F496201-89-K-0004)
(AD-A247326; AFOSR-92-0006TR) Avail: NTIS HC/MF A05

Progress in research on laser physics and laser techniques is summarized, including work on laser resonators and laser resonator and optical beam software; new techniques for laser beam characterization and laser beam quality measurement; the generation of ultrashort optical pulses in the infrared; and measurement of a fundamental excess quantum noise effect in ultrastable laser oscillators. GRA

N92-27393# Illinois Univ., Urbana. Fusion Studies Lab.
NUCLEAR-DRIVEN FLASHLAMP PUMPING OF THE ATOMIC IODINE LASER
G. H. Miley Mar. 1992 134 p
(Contract DE-FG07-88ER-12821)
(DE92-010609; DOE/ER-12821/T1) Avail: NTIS HC/MF A07

This report is a study of the atomic iodine laser pumped with nuclear-excited XeBr fluorescence. Preliminary experiments, conducted in the TRIGA reactor, investigated the fluorescence of the excimer XeBr under nuclear pumping with B-10 and He-3, for use as a flashlamp gas to stimulate the laser. These measurements included a determination of the fluorescence efficiency (light emitted in the wavelength region of interest, divided by energy deposited in the gas) of XeBr under nuclear pumping, with varying excimer mixtures. Maximum fluorescence efficiencies were approximately 1 percent. In order to better understand XeBr under nuclear excitation, a kinetics model of the system was prepared. The model generated the time-dependant concentrations of 20 reaction species for three pulse sizes: a TRIGA pulse; a fast burst reactor pulse; and an e-beam pulse. The modeling results predicted fluorescence efficiencies significantly higher (peak efficiencies of approximately 10 percent) than recorded in the fluorescence experiments. The cause of this discrepancy was not fully determined. A ray tracing computer model was also prepared to evaluate the efficiency with which nuclear-induced fluorescence generated in one cavity of a laser could be coupled into another cavity containing an iodine lasant. Finally, an experimental laser cell was constructed to verify that nuclear-induced XeBr fluorescence could be used to stimulate a laser. Lasing was achieved at 1.31 micron in the TRIGA using C3F7I, a common iodine lasant. Peak laser powers were approximately 20 mW. Measured flashlamp pump powers at threshold agreed well with literature values, as did lasant pressure dependency on laser operation. DOE

N92-27438# Texas Univ. at Dallas, Richardson. Center for Quantum Electronics.
PROOF OF THE FEASIBILITY OF COHERENT AND INCOHERENT SCHEMES FOR PUMPING A GAMMA RAY LASER Annual Letter Report, 24 Dec. 1990 - 23 Dec. 1991
C. B. Collins 31 Dec. 1991 103 p
(Contract N00014-90-K-2001)
(AD-A245372; UTD-GRL/9101) Avail: NTIS HC/MF A06

The most productive approaches to the problem of the gamma-ray laser have focused upon upconversion techniques in which metastable nuclei are pumped with long wavelength radiation. At the nuclear level the storage of energy can approach tera-Joules (10(exp 12)J) per liter for thousands of years. However, any plan to use such a resource for a gamma-ray laser poses problems of

a broad interdisciplinary nature requiring the fusion of concepts taken from relatively unrelated fields of physics. Our research group has described several means through which this energy might be coupled to radiation fields with cross sections for stimulated emission that could reach 10(exp -17) power sq cm. Such a stimulated release could lead to output powers as great as 3(10)(exp 21) power Watts/liter. Since 1978 we have pursued an approach for the upconversion of longer wavelength radiation incident upon isomeric nuclear populations that can avoid many of the difficulties encountered with traditional concepts of single photon pumping. GRA

N92-27443# Physics and Electronics Lab. TNO, The Hague (Netherlands).
PASCAL SOFTWARE FOR CO2-LASERRADAR RANGING WITH A HP9000 COMPUTER Final Report [PASCAL SOFTWARE VOOR CO2-LASERRADAR AFSTANDSMETINGEN MET DE HP9000]
G. W. vanderVegt Sep. 1991 34 p In DUTCH; ENGLISH summary
(AD-A245383; FEL-91-A159; TDCK-TD-91-2907) Avail: NTIS HC/MF A03

For a CW-CP2-laser multifunctional system, a software program was developed for system control and for performing measurements. This report is meant to be a guide for users of the system and to serve as a basis for future updating of the software. GRA

N92-27566# Stanford Univ., CA. Dept. of Electrical Engineering.
COHERENT ANALOG FM-SCM VIDEO TRANSMISSION USING DIRECT FREQUENCY MODULATION OF SEMICONDUCTOR LASERS
L. G. Kazovsky and J. C. Fan 1991 9 p
(Contract N00014-91-J-1857)
(AD-A247574) Avail: NTIS HC/MF A02

An analog coherent subcarrier multiplexing system for video transmission using frequency modulation of both the subcarrier and optical carrier is analyzed. Theoretical receiver sensitivity for realistic values of receiver noise and phase noise is approximately -41 dBm for 50 channels and -25 dBm for 100 channels. GRA

N92-27601# Science Applications International Corp., San Diego, CA.
LASER RADAR SYSTEM DEMONSTRATION: SYSTEM REQUIREMENTS REVIEW, SECOND DEMONSTRATION RECEIVER
3 Dec. 1991 48 p
(Contract N00014-88-C-2278)
(AD-A246159) Avail: NTIS HC/MF A03

A conceptual design is currently being developed for a sensor system which is capable of detecting both large and small targets using a pulsed transmitter and high bandwidth receiver. The mission scenario for the large target requires that it first be detected with a small false alarm rate, and immediately classified with a few additional transmitter pulses. The sensor must also be capable of detecting small targets with a low false alarm rate. Because a number of naturally occurring objects can cause false alarms, it is believed that the most effective means for mitigating these false alarms is to complete the classification or identification of the small target immediately following detection. This must be accomplished with negligible effect on the overall search rate. It is desirable, but not presently a requirement, that the sensor system be capable of detecting these targets also. Two conceptual approaches were developed to meet the foregoing performance requirements of the desired sensor system. Both use short-pulse lasers to illuminate the target. In the first approach a high resolution image is created using a single range gate of reflected or backscattered light. The images have a large number of pixels, with square arrays of the order of 128x128 to 256x256. In the second approach, a more limited array of time-resolved pixels is used to gather three-dimensional data of the region containing the target. In the time-resolved approach, the array sizes are more limited because of the requirement for multiple channels of high-speed electronics. GRA

N92-27617 Department of the Navy, Washington, DC.
HOLMIUM LASER PUMPED WITH A NEODYMIUM LASER Patent
Steven R. Bowman, inventor (to Navy) and William S. Rabinovich, inventor (to Navy) 30 Jul. 1991 5 p Filed 15 Oct. 1990
(AD-D015220; US-Patent-5,036,520; US-Patent-Appl-SN-597127; US-Patent-Class-372-41) Avail: US Patent and Trademark Office

A solid-state laser device includes a neodymium laser pump source capable of outputting a pump beam of about 1.1 lim wavelength, and a holmium laser being pumped by said 1.1 lim pump beam to generate an output laser beam of about 3 lim wavelength. GRA

N92-27647# York Univ. (Ontario).
LABORATORY MEASUREMENTS OF THE TRANSMISSION AND SCATTERING OF LASER BEAMS IN OPTICALLY DENSE CLOUDS Ph.D. Thesis
Richard Brent Smith Sep. 1989 197 p
(ISBN-0-315-58085-2; CTN-92-60473) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Lidar has a large range of potentially useful applications in the area of remote sensing. Unfortunately the analysis of lidar data is handicapped by a lack of understanding of how the scattering generated in the scattering media affects the measured lidar signal. The development and use of a sophisticated laboratory scattering facility developed to study many aspects of the scattering in dense aerosol media is described. Through a number of innovative measurement techniques measurements having unprecedented sensitivity and capabilities have been performed. The primary concern of these measurements was the study of the forward scatter generated as a laser pulse propagates through a scattering medium and how this forward scatter subsequently affects the measured lidar return. The results show that the forward scatter can be very important, causing very large deviations from the normally assumed behavior. These measurements suggest that the forward scatter has a much more important role to play in lidar measurement than previously thought. In addition to illustrating the effect which the forward scatter can have, methods of reducing its influence were also studied. Author (CISTI)

N92-27657# Air Force Inst. of Tech., Wright-Patterson AFB, OH. Foreign Technology Div.
ENERGY TRANSFORMATION PROPERTIES AND MECHANISMS IN TRANSVERSE FLOW DISCHARGED CO2 LASERS
Zhongxiang Wu 10 Dec. 1991 11 p Transl. into ENGLISH from Zhongguo Jiguang (China), v. 16, no. 10, 1989 p 625-626
(AD-A246037; FTD-ID(RS)T-1475-90) Avail: NTIS HC/MF A03

We simulated, calculated, and analyzed the effects on the various energy state transformation properties of dielectric media of such factors as dielectric media gas pressures, flow speeds, light cavity position, strength of radiation in the cavity, degree of output coupling, and other similar factors in transverse flow discharged CO2 laser devices. This article did concrete calculations of the corresponding energy transformation properties for the apparatus and the conditions of: transverse flow, discharge, CO2 laser device, dielectric medium constituent ratio of CO2:N2:H = 5:17:78, an initial temperature of 293 K, a discharge current of 2 A E/N: 2.15 x 10(exp -16) V/cm(exp 2), light cavity 160 cm(exp 2) long (sic), height 1.8 cm, as well as other parameters. GRA

N92-27659# Naval Postgraduate School, Monterey, CA.
FREE ELECTRON LASER SHORT PULSE SIMULATION AND TWO-MODE SIDEBAND ANALYSIS M.S. Thesis
Gregory A. Cord Jun. 1991 63 p
(AD-A246044) Avail: NTIS HC/MF A04

The Stanford Free Electron Laser (FEL), like many FELs is

driven by extremely short electron pulses which drive equally short optical pulses. Simulations of the Stanford FEL describe the trapped-particle instability leading to sideband frequencies and limit-cycle behavior. Comparisons are made of recent experimental results that show close agreement between the desynchronism curves, optical spectra, and the electron spectra. The second part of this thesis analyzes sideband behavior when two modes are present in an FEL oscillator. Using two-mode wave and pendulum equations derived from Maxwell's and the Lorentz force equations, the gain and phase shift for each initial phase of the two-mode optical field can be determined numerically. Averaging over all initial phases determines the FEL optical performance. In steady-state the presence of the sideband effectively reduces the undulator's length, delaying the onset of saturation. This allows more power to be generated in the optical field then possible with only a single mode. Author (GRA)

N92-27698# York Univ. (Ontario).
A COMPARISON OF THE MEASURED AND MODELLED EFFECTS OF BREWSTER ANGLE ANISOTROPIES UPON PULSED XeCl EXCIMER LASER OUTPUT Ph.D. Thesis
John Frederick Hahn Apr. 1989 292 p
(ISBN-0-315-49569-3; CTN-92-60476) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The effectiveness of stacked, fused-silica, intra-cavity Brewster plates in generating highly polarized XeCl laser output was demonstrated. Output polarization in excess of 95 percent, with coincident energy degradation of less than 20 percent was observed, data which compare favorably with results obtained from more sophisticated, more expensive intra-cavity laser polarizers. The optimal arrangement of the polarizing plates is shown to be at the rear of the cavity, near the mirror. The temporal development of the component pulses and the degree of polarization was observed. For the optimal rear polarizer arrangements, the polarization was shown to be large throughout the entire observable phase. The dependence of the polarization upon the gas mixture pressure when weaker anisotropies are in place was observed. A model was established to simulate the experimental results. The model is an innovative use of established rate equations and also makes use of the short coherence length of XeCl emissions to permit decoupling of the p- and s-plane polarization components, thus avoiding the more complicated semi-classical model which makes explicit use of the vector properties of the polarization components. The presence of Brewster angle plates in the cavity is accounted for as changes in the effective mirror/outcoupler reflectivities in the respective planes of polarization. The model was used to predict what operating conditions are required to successfully implement the use of Brewster angle end windows in highly polarized output. Author (CISTI)

N92-28051# California Univ., Irvine. Dept. of Chemistry.
KINETICS OF SURFACE REACTIONS STUDIED BY LASER DESORPTION WITH FTMS DETECTION Final Technical Report, 1 Nov. 1988 - 31 Oct. 1990
John C. Hemminger and Robert T. McIver, Jr. 2 Jan. 1992 2 p
(Grant AF-AFOSR-0019-89)
(AD-A248412; AFOSR-92-0197TR) Avail: NTIS HC/MF A01

The mechanism of laser induced desorption was investigated by comparing the wavelength and pulse energy dependence of laser desorption from thermally thin metal films of a variety of thicknesses. We are able to distinguish thermal versus non-thermal laser desorption mechanisms. GRA

N92-28124# California Univ., Santa Barbara.
DEVELOPMENT AND UTILIZATION OF THE UNIVERSITY OF CALIFORNIA, SANTA BARBARA, FREE-ELECTRON LASER Final Report, 15 Sep. 1986 - 14 Sep. 1991
Vincent Laccarino 11 Feb. 1992 12 p
(Contract N00014-86-K-0692)
(AD-A248733) Avail: NTIS HC/MF A03

A research program has been carried out to advance the science and technology of free-electron lasers and their applications. The overall objectives of the program were: (1) development of free-electron lasers in the millimeter and far-infrared region; (2) facilitate the application of far-infrared free-electron lasers to research in frontier science and technology; and (3) training of researchers in the development, operation, and application of free-electron lasers. A free electron laser-facility has been developed which is operational from 200 GHz to 4.8 THz, tunable under computer control, and able to deliver kilowatts of millimeter wave and far-infrared power. An important part of this facility is a well equipped user lab that has been used to perform ground breaking experiments in scientific areas as diverse as biophysics, bio-medicine, magnetism, semiconductors, and laser physics. Nine graduate students and post doctoral researchers have been trained in the operation, use, and application of these free-electron lasers. GRA

N92-28131# California Univ., Santa Barbara. Quantum Inst.
DEVELOPMENT AND SCIENTIFIC UTILIZATION OF THE UNIVERSITY OF CALIFORNIA, SANTA BARBARA FREE-ELECTRON LASER Final Technical Report, 1 Jun. 1986 - 31 May 1991
Vincent Jaccarino 31 May 1991 11 p
(Contract N00014-86-K-0692)
(AD-A246803) Avail: NTIS HC/MF A03

A research program was carried out to advance the science and technology of free electron lasers and their applications. The overall objectives of the program were the following: development of free-electron lasers in the millimeter and far-infrared region; facilitate the application of far-infrared free-electron lasers to research in frontier science and technology; and training of researchers in the development, operation, and application of free-electron lasers. A free electron laser facility, was developed which is tunable under computer control and able to deliver kilowatts of millimeter wave and far infrared power. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

N92-27203# Naval Postgraduate School, Monterey, CA.
EXPERIMENTAL INVESTIGATION OF ENERGY DISSIPATION IN FINITE-AMPLITUDE STANDING WAVES M.S. Thesis
Chih-Lyeu Chen Jun. 1991 70 p
(AD-A246428) Avail: NTIS HC/MF A04

Thermoacoustic engines are designed to perform optimally at one frequency. However, the thermoacoustic prime movers have been shown to generate highly nonlinear waveforms, in which a significant amount of the acoustic energy appears in higher harmonics. This condition reduces the overall efficiency of the engine. The harmonics can be suppressed. But this does not necessarily mean that more energy remains in the fundamental frequency. This is the topic of this thesis. Finite-amplitude standing waves were generated in a standing wave tube. The steady state input acoustic power was compared to the steady state dissipated acoustic power for two configurations - an empty tube and an obstructed tube - over a wide range of input powers. The waveforms in the empty tube were rich in harmonics, whereas the obstruction suppressed the harmonics significantly. The results of the measurements indicate that suppression of the harmonics also suppresses the transfer of energy from the fundamental. Author (GRA)

N92-27394# Booz-Allen and Hamilton, Inc., Bethesda, MD.
HEAVY DUTY TRANSPORT RESEARCH NEEDS ASSESSMENT
13 Sep. 1991 183 p
(Contract DE-AC01-89ER-30148)
(DE92-010622; DOE/ER-30148/T1) Avail: NTIS HC/MF A09

As a result of the desire to decrease the dependence of the U.S. on foreign petroleum as a transportation fuel, this report

assesses the research needs to further develop heavy duty engines. The topics covered include diesel engines, alternative fuels, electric vehicle technology, gas turbine engines, and Stirling cycle alternative engines. DOE

N92-27410# Argonne National Lab., IL.
TRIBOLOGICAL BEHAVIOR OF OIL-LUBRICATED, TiN-COATED STEEL
O. O. Ajayi, A. Erdemir, G. R. Fenske, F. A. Nichols, W. D. Sproul, M. Graham, and P. J. Rudnik (Northwestern Univ., Evanston, IL.) Feb. 1992 21 p Presented at the International Conference on Metallurgical Coatings and Thin Films, San Diego, CA, 6-10 Apr. 1992
(Contract W-31-109-eng-38)
(DE92-010500; ANL/CP-75676; CONF-920439-4) Avail: NTIS HC/MF A03

The effects of titanium nitride (TiN) coatings on the tribological behavior of M50 and 52100 steels under both dry and synthetic polyol ester-based oil lubrication were evaluated using a reciprocating sliding pin-on-flat test machine. Under dry conditions, the TiN coating reduced the wear, which occurred by abrasion as well as the oxidation of the sliding surface. It also reduced the amount of wear-debris accumulation at the contact interface. During oil lubrication, wear and roughening of the contact area, usually associated with the boundary lubrication regime, was eliminated by the TiN coating. Formation of boundary film by the chemical interaction between the oil additives and wearing surface was also prevented by the TiN coating. DOE

N92-27431# National Aerospace Lab., Kakuda (Japan). Research Center.
AN EXPERIMENTAL STUDY OF A SMALL HIGH SPEED LH2 ROCKET PUMP: A SUPPRESSION METHOD OF ASYNCHRONOUS SHAFT VIBRATIONS Report No. 1
Mitsuo Watanabe, Makoto Yoshida, Satoshi Hasegawa, and Kenjirou Kamijou Jul. 1991 16 p In JAPANESE; ENGLISH summary
(NAL-TR-1118; ISSN-0389-4010; JTN-92-80385) Avail: NTIS HC/MF A03

Liquid Hydrogen (LH2) rocket pumps must be operated at high speed due to the low density of LH2, with this requirement being even greater for upper stage rocket engine and Orbiter Transfer Vehicle (OTV) pumps. In these operating conditions, the suppression of shaft vibration is one of the most complex design problems since the damping effect is very small due to the extremely low LH2 viscosity. Many shaft vibration problems have occurred during the development of actual pumps, e.g., the Liquid Rocket Engine-5 (LE-5) and Space Shuttle Main Engine (SSME) LH2 pumps. This paper describes a new pump configuration which was developed using a mechanical design method that allows the operational speed to be lower than the critical speed. The new pump operated smoothly at its designed rotational speed of 50,000 rpm and was within permissible shaft vibration limits. This method was subsequently applied to the design of the LE-7 high pressure liquid oxygen pump. Author (NASDA)

N92-27432# National Aerospace Lab., Tokyo (Japan). Space Technology Research Group.
ANTENNA POINTING SYSTEM MOUNTED ON A FLEXIBLE SPACE STRUCTURE
Isao Yamaguchi, Takashi Kida, Seiya Ueno, and Masaki Tanaka Aug. 1991 33 p In JAPANESE; ENGLISH summary
(NAL-TR-1119; ISSN-0389-4010; JTN-92-80386) Avail: NTIS HC/MF A03

The enhancement of structural damping for suppression of vibrations caused by dynamic interactions of an antenna pointing system mounted on a flexible space structure is examined, and groundbased experimental results performed to demonstrate its efficiency are discussed. Damping augmentation is achieved using a type of Proof Mass Actuator (PMA) driven by a control law based on Direct Velocity FeedBack (DVFB). Experiments show that this actuator successfully stabilizes the structure which is otherwise destabilized by the antenna pointing system. It is additionally found that the antenna pointing system occasionally displays a nonlinear limit cycle caused by the friction torque. A numerical model is developed to analyze these phenomena and a computer simulation is performed. All experimental results show good agreement with the analysis. Author (NASDA)

N92-27439# Logistics Management Inst., Bethesda, MD.
AN ASSESSMENT OF THE ECONOMIC STATUS OF THE ANTIFRICTION BEARING INDUSTRY Final Report
Donna J. Peterson, Gerald T. Kelley, and Myron G. Myers Oct. 1991 97 p
(Contract MDA903-90-C-0006)
(AD-A245373; LMI-PL105R1) Avail: NTIS HC/MF A05

Military equipment with moving parts requires antifriction bearings. Superprecision bearings, which are manufactured with closer tolerances under more stringent conditions, are often needed to meet high-performance characteristics such as silencing in submarines. A steady increase in imports of antifriction bearings coupled with reduced prices and profitability in the domestic industry led domestic manufacturers to seek legislative and regulatory relief from foreign competition. Since 1987, the Government has provided two types of relief to the industry. First, after a Department of Commerce investigation established that foreign producers were selling products in the U.S. market at prices below those they charged in their home markets, the Government imposed antidumping duties on several types of bearings from 12 countries. Second, the DoD restricted the purchase of antifriction bearing for use in defense end items to those of domestic manufacture. Although that restriction is due to expire on 30 Sep. 1991, the DoD may renew it for an additional 2 years if conditions warrant. This study assesses the current economic health of the U.S. antifriction bearing industry, analyzes the relative impact of the two forms of relief provided to the industry, and discusses the advantages and disadvantages of DoD's policy options. GRA

N92-27629 Department of the Navy, Washington, DC.
BURST DIAPHRAGM SEQUENCE VALVE Patent
Bradley D. Wisneskie, inventor (to Navy), Sheldon Hyman, inventor (to Navy), and Charles E. Hallum, inventor (to Navy) 12 Nov. 1991 6 p Filed 24 Jan. 1991
(AD-D015241; US-Patent-5,063,958; US-Patent-Appl-SN-647312; US-Patent-Class-137-68.1) Avail: US Patent and Trademark Office

A burst diaphragm sequence valve which effectively combines the structure of a burst diaphragm with that of an ordinary swing check valve, the pivot of the ordinary swing check valve being replaced by an integral flexural hinge. The sequence valve provides a way to sequentially burn solid propellant hot gas generators which exit into a common gas manifold, thereby enabling gas-powered devices to operate for a longer time than the duration of one gas generator burn. GRA

N92-27851# Southwest Research Inst., San Antonio, TX. Fuels and Lubricants Research Facility.
THE RELATIONSHIP BETWEEN FUEL LUBRICITY AND DIESEL INJECTION SYSTEM WEAR Interim Report, 1 Sep. 1990 - 1 Nov. 1991
Paul I. Lacy Jan. 1992 130 p
(DA Proj. 1L2-63001-D-150)
(AD-A247927; BFLRF-275) Avail: NTIS HC/MF A07

Use of low-lubricity fuel may have contributed to increased failure rates associated with critical fuel injection equipment during the 1991 Operation Desert Storm. However, accurate quantitative analysis of failed components from the field is almost impossible due to the unique service history of each pump. This report details the results of pump stand tests with fuels of equal viscosity, but widely different lubricity. Baseline tests were also performed using reference no. 2 diesel fuel. Use of poor lubricity fuel under these controlled conditions was found to greatly reduce both pump durability and engine performance. However, both improved metallurgy and fuel lubricity additives significantly reduced wear. Good correlation was obtained between standard bench tests and lightly loaded pump components. However, high contact loads on

isolated components produced a more severe wear mechanism that is not well reflected by the Ball-on-Cylinder Lubricity Evaluator. GRA

N92-27879*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ANALYSIS AND MODIFICATION OF A SINGLE-MESH GEAR FATIGUE RIG FOR USE IN DIAGNOSTIC STUDIES
James J. Zakrajsek, Dennis P. Townsend, Fred B. Oswald, and Harry J. Decker May 1992 20 p
(RTOP 505-63-36; DA Proj. 1L1-62211-A-47A)
(NASA-TM-105416; E-6826; NAS 1.15:105416; AVSCOM-TR-91-C-049) Avail: NTIS HC/MF A03

A single-mesh gear fatigue rig was analyzed and modified for use in gear mesh diagnostic research. The fatigue rig allowed unwanted vibration to mask the test-gear vibration signal, making it difficult to perform diagnostic studies. Several possible sources and factors contributing to the unwanted components of the vibration signal were investigated. Sensor mounting location was found to have a major effect on the content of the vibration signal. In the presence of unwanted vibration sources, modal amplification made unwanted components strong. A sensor location was found that provided a flatter frequency response. This resulted in a more useful vibration signal. A major network was performed on the fatigue rig to reduce the influence of the most probable sources of the noise in the vibration signal. The slave gears were machined to reduce weight and increase tooth loading. The housing and the shafts were modified to reduce imbalance, looseness, and misalignment in the rotating components. These changes resulted in an improved vibration signal, with the test-gear mesh frequency now the dominant component in the signal. Also, with the unwanted sources eliminated, the sensor mounting location giving the most robust representation of the test-gear meshing energy was found to be at a point close to the test gears in the load zone of the bearings. Author

N92-27996# Dayton Univ., OH.
DETERMINATION OF MINIMUM ADHEREND THICKNESS FOR CLIMBING DRUM AND FLOATING ROLLER ADHESIVE TESTS Interim Report, Nov. 1988 - Oct. 1990
T. J. Whitney and D. R. Askins Jan. 1992 84 p
(Contract F33615-85-C-5094)
(AD-A248883; UDR-TR-91-35; WL-TR-91-4086) Avail: NTIS HC/MF A05

The Climbing Drum Peel Test (ASTM D1718-76) and the Floating Roller Peel Test (ASTM D3167-76) are adhesive joint tests used to determine adhesive strength in honeycomb core tactical shelter panels. The failure modes and geometries of these tests tend to differ from specimen to specimen, however, depending on the ratio of adhesive strength to flexible adherend stiffness. This inconsistency generates peel strength data which cannot be directly compared. Although the problem can be solved by making the flexible adherend very thick so that all failure geometries are alike, the result is a loss in precision in the test results. An analysis of these test methods was performed in order to specify the minimum flexible adherend thicknesses which produce consistent failures. Experiments confirmed these predictions. Parametric studies and experiments indicate that, among the properties examined, glue line thickness and yield strength of the adherend most affect the minimum adherend thickness which can be used. A first order analysis was also conducted in order to correct the results of peel tests which do not fail in a consistent manner (i.e., the adherends detach from the test fixture rollers). GRA

N92-28074# Naval Postgraduate School, Monterey, CA.
COMPARISON OF UNCONSTRAINED AND CONSTRAINED CALIBRATION METHODS M.S. Thesis
Michael J. Wiegand Jun. 1991 81 p
(AD-A246941) Avail: NTIS HC/MF A05

The idea of using a passive end point motion constraint to calibrate robot manipulators is of particular interest because no measurement equipment is required. The accuracy attained using this method is compared to the accuracy attained by an unconstrained calibration using computer simulated measurements. A kinematic model is established for each configuration using the Denavit-Hartenberg methodology. The kinematic equations are formulated and are used in the computer simulated calibration to determine the actual kinematic parameters of the manipulator. The results are discussed in terms of the effect of measurement noise and the number of experimental observations on the accuracy of parameter identification. GRA

N92-27299*# Boeing Co., Seattle, WA. Defense and Space Group.
EVALUATION OF SEALS, LUBRICANTS, AND ADHESIVES USED ON LDEF Abstract Only
H. Gary Pippin, Bruce Keough, and Harry Dursch *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 93 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27304*# Centre National d'Etudes Spatiales, Toulouse (France).
NEW RESULTS FROM FRECOPA ANALYSIS Abstract Only
Christian Durin *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 100 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27305*# Boeing Co., Seattle, WA. Defense and Space Group.
MECHANISMS FLOWN ON LDEF Abstract Only
Harry Dursch and Steve Spear *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 101 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27722*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OVERVIEW OF MAGNETIC SUSPENSION RESEARCH AT LANGLEY RESEARCH CENTER
Nelson J. Groom *In its* International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 3-23 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27723*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
PROFESSOR JESSE W. BEAMS AND THE FIRST PRACTICAL MAGNETIC SUSPENSION
P. E. Allaire, R. R. Humphris, and D. W. Lewis *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 25-32 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27724*# Old Dominion Univ., Norfolk, VA. Dept. of Mechanical Engineering and Mechanics.
LARGE-GAP MAGNETIC SUSPENSION SYSTEMS
Colin P. Britcher *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 33-49 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27725*# Societe Europeenne de Propulsion, Vernon (France).
MAGNETIC BEARINGS: A KEY TECHNOLOGY FOR ADVANCED ROCKET ENGINES?
J. Ph. Girault *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 53-72 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27726*# Ingersoll-Rand Co., Phillipsburg, NJ.
ACTIVE MAGNETIC BEARINGS: AS APPLIED TO CENTRIFUGAL PUMPS

Lev Nelik, Paul Cooper, Graham Jones, Dennis Galecki, Frank Pinckney, and Gordon Kirk (Virginia Polytechnic Inst. and State Univ., Blacksburg.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 73-88 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27727*# North Carolina Univ., Charlotte. Dept. of Electrical Engineering.
PRECISION MAGNETIC SUSPENSION LINEAR BEARING
David L. Trumper and Michael A. Queen *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 89-103 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27728*# Maryland Univ., College Park. Dept. of Mechanical Engineering.
MODELLING AND DESIGN FOR PM/EM MAGNETIC BEARINGS
D. Pang, J. A. Kirk, D. K. Anand, R. G. Johnson, and R. B. Zmood (Royal Melbourne Inst. of Tech., Australia) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 105-120 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27729*# SatCon Technology Corp., Cambridge, MA.
APPLICATION OF NARROW BAND CONTROL TO REDUCE VIBRATIONS IN MAGNETIC BEARING SYSTEMS
Monique S. Gaffney and Bruce G. Johnson *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 123-147 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27730*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
DYNAMICS AND CONTROL OF HIGH PRECISION MAGNETICALLY LEVITATED VIBRATION ISOLATION SYSTEMS
K. Youcef-Toumi and T-J. Yeh *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 149-180 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27731*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
STABILITY AND PERFORMANCE OF NOTCH FILTER CONTROL FOR UNBALANCE RESPONSE
C. R. Knospe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 181-205 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27732*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
A SIX DEGREE-OF-FREEDOM MAGNETIC BEARING FOR MICROGRAVITY VIBRATION ISOLATION
A. Peter Allan and Carl R. Knospe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 209-218 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27733*# SatCon Technology Corp., Cambridge, MA.
A SIX DEGREE-OF-FREEDOM LORENTZ VIBRATION ISOLATOR WITH NONLINEAR CONTROLLER
Ralph C. Fenn *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 219-244 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27734*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
RECENT PROGRESS TOWARDS DEVELOPING A HIGH FIELD, HIGH-T(SUB c) SUPERCONDUCTING MAGNET FOR MAGNETIC SUSPENSION AND BALANCE SYSTEMS
L. Pierre deRochemont, Carlton E. Oakes, Michael R. Squillante, Hong-Min Duan, Allen M. Hermann, Robert J. Andrews, Roger B. Poeppel, Victor A. Maroni (Argonne National Lab., IL.), Ingrid A. Carlberg, and Warren C. Kelliher *In its* International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 247-266 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27735*# Academy of Sciences (USSR), Moscow. Inst. of Chemical Physics.
LEVITATION OF YBa2Cu3O(7-x) SUPERCONDUCTOR IN A VARIABLE MAGNETIC FIELD
Alexander N. Terentiev and Anatoliy A. Kuznetsov *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 267-278 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27736*# Houston Univ., TX. Center for Superconductivity.
HYBRID SUPERCONDUCTING MAGNETIC BEARING (HSMB) FOR HIGH LOAD DEVICES
C. K. McMichael, K. B. Ma, M. A. Lamb, M. W. Lin (California Inst. of Tech., Pasadena.), L. Chow, R. L. Meng, P. H. Hor, and W. K. Chu *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 279-287 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27737*# Koyo Seiko Co. Ltd., Kokubuhiganjo (Japan).
CHARACTERIZATION OF SUPERCONDUCTING MAGNETIC BEARINGS (DYNAMIC STIFFNESS AND DAMPING COEFFICIENT IN AXIAL DIRECTION)
Ryoichi Takahata, Hirochika Ueyama, and Tsutom Yotsuya (Osaka Prefectural Industrial Technology Research Inst., Enokojima Japan) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 289-296 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27738*# Pratt and Whitney Aircraft, East Hartford, CT.
FEASIBILITY OF MAGNETIC BEARINGS FOR ADVANCED GAS TURBINE ENGINES
David Hibner and Lewis Rosado (Wright Lab., Wright-Patterson AFB, OH.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 299-316 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27739*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
LOW POWER MAGNETIC BEARING DESIGN FOR HIGH SPEED ROTATING MACHINERY
P. E. Allaire, E. H. Maslen, R. R. Humphris, C. K. Sortore, and P. A. Studer (Magnetic Concepts, Silver Spring, MD.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 317-329 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27740*# Moscow Inst. of Aviation Technology (USSR).
PROGRESS OF MAGNETIC SUSPENSION SYSTEMS AND MAGNETIC BEARINGS IN THE USSR
A. V. Kuzin *In* NASA. Langley Research Center, International

Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 331-359 Previously announced in IAA as A91-38579 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27741*# Virginia Univ., Charlottesville. Center for Innovative Technology.
EXTENDED H2 SYNTHESIS FOR MULTIPLE DEGREE-OF-FREEDOM CONTROLLERS
R. David Hampton and Carl R. Knospe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 363-383 Sponsored in part by NASA. Lewis Research Center; and by Center for Innovative Technology of the Commonwealth of Virginia (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27742*# North Carolina Univ., Charlotte. Dept of Electrical Engineering.
EXPERIMENTAL RESULTS IN NONLINEAR COMPENSATION OF A ONE DEGREE-OF-FREEDOM MAGNETIC SUSPENSION
David L. Trumper, James C. Sanders, Tiep H. Nguyen, and Michael A. Queen *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 385-400 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27743*# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Mechatronics Lab.
CONTROL CONCEPTS FOR ACTIVE MAGNETIC BEARINGS
Roland Siegwart, D. Vischer, R. Larsonneur, R. Herzog, Alfons Traxler (MECOS Traxler A.G., Winterthur, Switzerland), H. Bleuler, and G. Schweitzer *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 401-422 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27744*# Tsinghua Univ., Bejing (China). Lab. of Mechatronics and Control.
COMPUTER AIDED DESIGN OF DIGITAL CONTROLLER FOR RADIAL ACTIVE MAGNETIC BEARINGS
Zhong Cai, Zupei Shen, Zuming Zhang (Beijing Inst. of Printing, China), and Hongbin Zhao *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 423-431 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27745*# Virginia Univ., Charlottesville. Center for Magnetic Bearings.
A MICROGRAVITY VIBRATION ISOLATION RIG
Bibhuti B. Banerjee, Carl R. Knospe, and Paul E. Allaire *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 435-456 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27746*# TG and C Associates, Inc., Falmouth, VA.
VIBRATION DAMPING OF ELASTIC WAVES IN ELECTRICALLY CONDUCTING MEDIA SUBJECTED TO HIGH MAGNETIC FIELDS
T. G. Horwath *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 457-471 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27747*# British Columbia Univ., Vancouver. Dept. of Electrical Engineering.
COARSE-FINE RESIDUAL GRAVITY CANCELLATION SYSTEM WITH MAGNETIC LEVITATION
S. E. Salcudean, H. Davis, C. T. Chen, D. E. Goertz, and B. V. Tryggvason (Canadian Space Agency, Ottawa, Ontario) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 1 May 1992 p 473-492 (For primary document see N92-27721 18-18)
Avail: NTIS HC/MF A20

N92-27780*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ON THE USE OF TORQUE-WHEELS FOR THE CONTROL OF LARGE, FLEXIBLE, SPACE-BASED TELEROBOTIC ARMS
Dave Ghosh, R. C. Montgomery, and S. P. Kenny *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 207-222 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

N92-27794*# Forschungszentrum Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Grenzflaechenforschung und Vakuumphysik.
WIDE GAP, PERMANENT MAGNET BIASED MAGNETIC BEARING SYSTEM
Karl Boden *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 575-594 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27795*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
FORCE ANALYSIS OF MAGNETIC BEARINGS WITH POWER-SAVING CONTROLS
Dexter Johnson, Gerald V. Brown, and Daniel J. Inman (State Univ. of New York, Buffalo.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 595-613 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27796*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Guidance and Control Section.
MANIPULATION AND IDENTIFICATION OF OBJECTS BY MAGNETIC FORCES
Benjamin Joffe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 617-638 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27797*# IBM Research Lab., Yorktown Heights, NY.
PRECISE POSITIONING AND COMPLIANCE SYNTHESIS FOR AUTOMATIC ASSEMBLY USING LORENTZ LEVITATION
R. L. Hollis and S. Salcudean (British Columbia Univ., Vancouver.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 639-654 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27799*# Virginia Univ., Charlottesville. Center for Magnetic Bearings.
DESIGN OF BEARINGS FOR ROTOR SYSTEMS BASED ON STABILITY
D. Dhar, L. E. Barrett, and C. R. Knospe *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 673-690 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27805*# Foster-Miller Associates, Inc., Waltham, MA.
ATTRACTIVE AND REPULSIVE MAGNETIC SUSPENSION SYSTEMS OVERVIEW
David B. Cope and Richard R. Fontana *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 791-812 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27807*# TG and C Associates, Inc., Falmouth, VA.
THE CONCEPT OF THE MECHANICALLY ACTIVE GUIDEWAY AS A NOVEL APPROACH TO MAGLEV
T. G. Horwath *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 827-843 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27808*# SRI International Corp., Menlo Park, CA. Information, Telecommunications, and Automation Div.
SPACE APPLICATIONS OF DIAMAGNETIC SUSPENSIONS
Ronald E. Pelrine *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 847-856 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27809*# Aerospatiale, Les Mureaux (France).
MAGNETIC BEARING WHEELS FOR VERY HIGH POINTING ACCURACY SATELLITE MISSIONS
J. P. Roland *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 857-872 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27812*# Knolle Magnetrans, San Francisco, CA.
KNOLLE MAGNETRANS: A MAGNETICALLY LEVITATED TRAIN SYSTEM
Ernst G. Knolle *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 907-918 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27814*# British Columbia Univ., Vancouver. Dept. of Physics.
LARGE-GAP MAGNETIC POSITIONING SYSTEM HAVING ADVANTAGEOUS CONFIGURATION
Paul Chong, Colin Commandeur, Harold Davis, and Lorne Whitehead *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 941-953 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27815*# SatCon Technology Corp., Cambridge, MA.
PERFORMANCE OF A SUPERCONDUCTING LARGE-ANGLE MAGNETIC SUSPENSION
James R. Downer, Dariusz A. Bushko, Vijay Gondhalekar, and Richard P. Torti *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 955-970 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

N92-27816*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE LARGE-ANGLE MAGNETIC SUSPENSION TEST FIXTURE
Colin P. Britcher, Mehran Ghofrani, Thomas C. Britton (Lockheed Engineering and Sciences Co., Hampton, VA.), and Nelson J. Groom *In its* International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 971-999 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N92-27602# Naval Postgraduate School, Monterey, CA.
HIGHLIGHTS OF TOTAL QUALITY MANAGEMENT IN THE DEPARTMENT OF DEFENSE: LESSONS LEARNED, QUALITY MEASUREMENTS, AND INNOVATIVE PRACTICES M.S. Thesis
Carolyn L. Applegate 26 Sep. 1991 112 p
(AD-A246167) Avail: NTIS HC/MF A06

This thesis aids in understanding the implementation of Total Quality Management (TQM) through both quantitative and qualitative analyses. Interviews were conducted with top executives from ten organizations within the Department of Defense (DOD). Survey questionnaires on perceptions of quality practices were administered to a sample of 102 representing members of the executive steering committees at the same organizations. Research identifies lessons learned by top executives during TQM implementation, discusses measures of organization-wide quality management, specifies evaluation mechanisms to discern strategic issues vital to a quality focus, and describes the TQM implementation plan. Research also identifies innovative practices such as self-managing work teams, learning centers and productivity gain sharing, which may benefit the top executive during his/her own TQM implementation. Conclusions and recommendations concern maturity of TQM implementations in the DOD, performance appraisal systems and quality assessment tools. GRA

N92-27649*# NSI Technology Services Corp., Research Triangle Park, NC.
METHODOLOGY FOR THE DETERMINATION OF CRITICALITY CODES AND RECERTIFICATION INTERVALS FOR TANK MOUNTED AIR COMPRESSORS (TMAC) AND BASE MOUNTED AIR COMPRESSORS (BMAC)
William T. Hargrove 1991 33 p Presented at the NASA Pressure Systems Seminar, Bay St. Louis, MS, 5-7 Nov. 1991
(Contract NAS5-30343)
(NASA-CR-189268; NAS 1.26:189268) Avail: NTIS HC/MF A03

This methodology is used to determine inspection procedures and intervals for components contained within tank mounted air compressor systems (TMAC) and base mounted air compressor systems (BMAC). These systems are included in the Pressure Vessel and System Recertification inventory at GSFC. Author

N92-27760# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
AN ANALYSIS OF TOTAL QUALITY MANAGEMENT IN AERONAUTICAL SYSTEMS DIVISION M.S. Thesis
Mark D. Caudle Sep. 1991 145 p
(AD-A246661; AFIT/GSM/LSG/91S-6) Avail: NTIS HC/MF A07

This study investigated the major schools of thought on various aspects of quality management and quality improvement. Areas covered included definitions of waste and quality, views on the cost of quality, tools and techniques used for quality improvement, and management philosophies and frameworks for continuous improvement. In addition, this study analyzed the structure and training content of the current Total Quality Management program at Aeronautical Systems Division (ASD). Pre- and post-test surveys on employee attitudes toward organizational effectiveness were analyzed from the Advanced Cruise Missile System Program Office (SPO), the F-15 SPO, and the ASD Deputy Chief of Staff for Human Resources (ASD/DP). Data was supplemented with semi-structured, personal interviews with ASD personnel involved in TQM. Survey analysis showed that the ACM SPO significantly improved, ASD/DP significantly digressed, and the F-15 SPO remained basically consistent. This led to the conclusion that ASD allows too much flexibility in the implementation of TQM in the three-letter organizations. GRA

N92-28055# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.
PRODUCT ASSURANCE PLANNING IN AN ENVIRONMENT OF INCREASED NEED FOR ACCOUNTABILITY
V. Esparza and C. Casey Oct. 1991 20 p
(Contract DE-AC07-76ID-01570)
(DE92-010850; EGG-EE-9965) Avail: NTIS HC/MF A03

Projects producing data are too often providing a product that is neither defensible nor usable. Instead of planning for data of known and required quality, managers are too often asking for (and getting) the wrong thing. The problem is a lack of correct planning strategy. A planning strategy to produce usable, defensible data requires communication from the customer to top-level management and from top-level management to the project leader, who must then communicate with the technical experts who will run the project. EPA requires that data quality objectives (DQOs) be derived for RI/FS projects. The DQO process is a top-down planning process that requires two-way communication; some organizations do not have structures suited for implementing DQOs as mandated by EPA. This paper discusses specific tools for imposing structure that will make the DQO process easier to follow for many organizations. The tools include a steering committee, a test design team, and Quality Function Deployment (QFD) matrices. The steering committee is a strong technical forum that can develop technical issues systematically and break down technical issues into manageable pieces that can be stated as test objectives. The test design team plans each test, systematically designs the test matrix, and guides the completion of test documentation that will be used to defend the data collected. QFD matrices are used as tools by both steering committee and test design team as a highly structured, systematic means of relating top-level (customer) requirements to data quality needs and measurement system design. DOE

N92-28171# University of Northern Illinois, De Kalb.
ESTIMATING THE RELIABILITY OF A SYSTEM ON THE BASIS OF SAMPLE PATHS Final Report, 15 Jun. 1989 - 14 Dec. 1991
Nader Ebrahimi and T. Ramalingam 14 Dec. 1991 4 p
(Grant AF-AFOSR-0402-90)
(AD-A248585; AFOSR-92-0257TR) Avail: NTIS HC/MF A01

Synergism or the so-called dependence among the components of multivariate process induces a host of probabilistic structures among the hitting times of the processes. Conventionally, hitting times have been studied for isolated processes or for families of processes exhibiting specific dependence structures. Whereas this approach has been very useful, stochastic modeling of hitting times per se is equally fruitful. For example, it is possible to derive useful bounds for the reliability of a complex system like the wing of an aircraft if the joint dependence structure of the hitting times to failure of the components of the system is known adequately. The joint behavior of two or more hitting times, one each from the components of multivariate processes is, therefore, of paramount importance in a plethora of disciplines. Research has continued on the development of positive (negative) dependence ideas and applied them to a number of areas. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N92-27213# Iowa Univ., Iowa City.
FATIGUE LIFE IMPROVEMENT OF AN AUTOFRETTAGE THICK-WALLED PRESSURE VESSEL WITH AN EXTERNAL GROOVE Final Report
Seung K. Koh and Ralph I. Stephens Jan. 1992 294 p
(Contract DAAA22-86-D-0278)
(AD-A247233; ARCCB-CR-92001) Avail: NTIS HC/MF A13

This report presents an investigation into a fatigue life improvement of an autofrettaged thick-walled pressure vessel with an external groove subjected to pulsating internal pressure, along with mean strain and mean stress effects on strain-controlled low cycle fatigue behavior. Linear elastic stress analysis of an autofrettaged thick-walled pressure vessel with an external groove is done using a finite element method. Autofrettage loading is performed using a thermal loading analogy. Change of external groove geometry is made using a quasi-optimization technique and finite element method to achieve longer fatigue life by relieving the stress concentration at the groove root. Surface treatment using shot peening is employed to produce compressive residual stresses at the vulnerable surface of the groove root to counteract the high tensile stresses. An evaluation of the fatigue life of an autofrettaged thick-walled pressure vessel with an external groove is done through a series of simulation fatigue tests using C-shaped specimens taken from the thick-walled pressure vessel. GRA

N92-27375*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
GROUND VIBRATION TESTS OF A HIGH FIDELITY TRUSS FOR VERIFICATION OF ON ORBIT DAMAGE LOCATION TECHNIQUES
Thomas A. L. Kashangaki May 1992 39 p Presented at the 33rd Structures, Structural Dynamics and Materials Conference, Dallas, TX, 13-15 Apr. 1992
(RTOP 590-14-31-01)
(NASA-TM-107626; NAS 1.15:107626; AIAA-Paper-92-2264)
Avail: NTIS HC/MF A03

This paper describes a series of modal tests that were performed on a cantilevered truss structure. The goal of the tests was to assemble a large database of high quality modal test data for use in verification of proposed methods for on orbit model verification and damage detection in flexible truss structures. A description of the hardware is provided along with details of the experimental setup and procedures for 16 damage cases. Results from selected cases are presented and discussed. Differences between ground vibration testing and on orbit modal testing are also described. Author

N92-27573# Army Cold Regions Research and Engineering Lab., Hanover, NH.
AN ANALYSIS OF THE STRESS WAVE IN SOLIDS (SWIS) FINITE ELEMENT CODE Special Report
Karen J. Faran Nov. 1991 38 p
(DA Proj. 4A1-61102-AT-24)
(AD-A245921; CRREL-SR-91-21) Avail: NTIS HC/MF A03

The ability to analyze wave propagation for geometrically complex circumstances is important in calculating ground motion caused by earthquakes, explosions, or other sources of seismic waves. Analytical models derived using separation of variables methods are limited in this area because they can only solve problems with simple geometry. For more complex situations, it is necessary to use finite element or finite difference schemes. In 1973, the finite element code Stress Waves In Solids (SWIS) was developed. It was used to solve several challenging problems because it includes a variety of seismic propagation modes: including body waves, interface waves, and diffraction. SWIS is able to simulate a number of seismic phenomena. Among the examples are the following: (1) explosions in geologically complex formations; (2) spontaneous earthquake ruptures and near-field ground motions; (3) disturbances in laterally varying earth models; and (4) wave propagation through buried and surface structures. SWIS is a versatile code in that it can solve problems in one, two, or three spatial dimensions in either Cartesian or cylindrical coordinates. Although the code assumes linear elasticity and isotropic materials, it is possible to solve problems in regions containing up to nine material types. The grid generator has a feature in which the grid size may be progressively expanded at 10 percent per zone to simulate a non-reflecting boundary. Finally, SWIS can solve either static, diffusion, or wave propagation problems. GRA

N92-27633# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
DUAL WAVELENGTH FIBER-OPTIC POLARIMETER FOR PATH-INTEGRATED STRAIN SENSING: APPLICATION TO THE MEASUREMENT OF LOCAL SLOPE ON A FLEXIBLE BEAM Thesis
Roderick David Turner 10 Oct. 1990 260 p
(UTIAS-337; ISSN-0082-5255; CTN-92-60451) Copyright Avail: NTIS HC/MF A12

An all-optical fiber, single-ended, polarimetric sensor system has been developed and characterized for applications in structural strain measurement, particularly in the aerospace field. Laser diode optical sources were operated at multiple wavelengths to achieve interferometric quadrature, and hence provide a linear sensor strain response. System behavior for path-integral strain measurements under DC conditions was determined for two sensors surface-adhered to aluminum cantilever beams. Linear strain responses were obtained which agreed well with theoretical sensitivities. The strain sensitivity of the polarimetric sensor at temperatures from 25 to 60 C was also found to be consistent with theory. One sensor was tested up to the 14-Hz second mode of beam vibration as a novel point-slope measuring device. The sensor responded linearly to changes in the relative orientation of its endpoints, as predicted by theory. Excellent angular tracking was demonstrated. The experimental observations are interpreted in terms of a comprehensive theoretical discussion of the polarimetric sensor's behavior, taking into account the effects of strain, temperature, and wavelength. A detailed analysis of the limitations of the sensor system is included, and recommendations are made as to the optimum practical implementation of this sensor for real applications. CISTI

N92-27643 Massachusetts Univ., Amherst.
CRACKS ON OR NEAR AN INTERFACE Ph.D. Thesis
Hsinhsi Lu 1991 173 p
Avail: Univ. Microfilms Order No. DA9132882

Problems for finite cracks on or near a bi-material interface were investigated. The crack under uniform pressure or a pair of concentrated loads on its faces was modelled by a dislocation density function along the crack length. For sub-interface crack problems, we investigated the case when the crack is near the interface of two half-planes and when the crack is near a coating-substrate system. In both cases, the singular integral equations are of the first kind and were solved numerically by expanding the unknown dislocation density function. When the crack is near the interface of two half-planes, the stress intensity factors and the energy release rate were obtained as a function of the crack-to-interface distance, and they approach the asymptotic solutions derived by Hutchinson et al. (1987) as the crack approaches the interface. In the case of a soft coating, alpha less than 0 with beta = 0.0, for all values of the thickness of the coating and the crack-to-interface distance, the normalized stress intensity factor K(sub I)/K(sub IO) and the normalized energy release rate G/G(sub O) are greater than 1, and the normalized stress intensity factor K(sub II)/K(sub IO) whether K(sub II)/K(sub IO) is positive or negative depends on the values of alpha, the crack-to-interface distance and the thickness of the coating. When the crack is on the interface of two half-planes, the singular integral equations are of the second kind and were solved exactly for the dislocation density function. We obtain an explicit expression for the stress intensity factors. The correction to the homogeneous stress intensity factor is of order epsilon apart from a multiplicative factor 2(sup ie), and the explicit expression of the loading are known. The stress intensity factors for a finite crack in an infinite homogeneous medium depend only on the first two coefficients of the loading in terms of Chebyshev polynomials.
Dissert. Abstr.

N92-27850# Naval Underwater Systems Center, New London, CT.
EXPLICIT SOLUTION OF DIFFERENCE EQUATION FOR THE WAVENUMBER RESPONSE OF FLUID-LOADED STIFFENED PLATE Progress Report
Albert H. Nuttall 19 Feb. 1992 23 p
(AD-A247922; NUWC-NL-TR-10015) Avail: NTIS HC/MF A03

A method for solving a difference equation encountered for excitation of a line-driven, fluid-loaded, infinite flat plate with nonperiodic attached rib stiffeners is presented. For the case of excitation by Q complex exponentials, a linear set of Q simultaneous equations must be solved for each wavenumber k. For the most general excitation, a linear integral equation must be solved at each k. A possible shortcut for obtaining solutions at certain shifted values of wavenumber k is pointed out. Acoustic radiation from the upper surface of a fluid-loaded stiffened plate has been examined by Cray. The formulation developed there produces an implicit algebraic equation for the Fourier transformed plate wavenumber response. This response must be manipulated into an explicit form in order to obtain a solution for the plate's structural response and to obtain the near- and far-field generated acoustic response. GRA

N92-27865# Aerospace Structures Information and Analysis Center, Wright-Patterson AFB, OH.
IDENTIFICATION OF DYNAMIC STRUCTURES WITH SPECIAL ATTENTION TO DAMPING MATRIX REPRESENTATION Final Report, 8 May - 25 Sep. 1991
Jay H. Kim 13 Jan. 1992 28 p
(Contract F33615-90-C-3211)
(AD-A248020; ASIAC-TR-91-1; WL-TR-91-3101) Avail: NTIS HC/MF A03

In finite element modeling, damping parameters, structural characteristics of joints, and boundary conditions are very difficult to estimate, causing discrepancy between analytic results and actual measured behavior. Various methods of structural identification were studied and compared in terms of their basic assumptions and advantages. A nonlinear optimization based method was thought to be promising for the identification of structures with highly uncertain structural parameters. An algorithm was developed to construct the damping matrix from experimental data. A computer program was developed for verification of this method. The method appeared to work well for lightly, viscously damped structures. GRA

N92-27872*# General Electric Co., Cincinnati, OH. Aircraft Engine Business Group.
ENGINE STRUCTURES MODELING SOFTWARE SYSTEM: COMPUTER CODE. USER'S MANUAL Final Report
Apr. 1992 339 p
(Contract NAS3-22767; RTOP 505-63-5B)
(NASA-CR-189154; NAS 1.26:189154) Avail: NTIS HC/MF A15

ESMOSS is a specialized software system for the construction of geometric descriptive and discrete analytical models of engine parts, components and substructures which can be transferred to finite element analysis programs such as NASTRAN. The software architecture of ESMOSS is designed in modular form with a central executive module through which the user controls and directs the development of the analytical model. Modules consist of a geometric shape generator, a library of discretization procedures, interfacing modules to join both geometric and discrete models, a deck generator to produce input for NASTRAN and a 'recipe' processor which generates geometric models from parametric definitions. ESMOSS can be executed both in interactive and batch modes. Interactive mode is considered to be the default mode and that mode will be assumed in the discussion in this document unless stated otherwise. Author

N92-27874*# Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
PARALLEL-VECTOR COMPUTATION FOR STRUCTURAL ANALYSIS AND NONLINEAR UNCONSTRAINED OPTIMIZATION PROBLEMS Final Report, period ending 15 Jun. 1990
Duc T. Nguyen Sep. 1990 558 p
(Contract NAS1-18584; RTOP 506-43-41-01)
(NASA-CR-186516; NAS 1.26:186516) Avail: NTIS HC/MF A24

Practical engineering application can often be formulated in the form of a constrained optimization problem. There are several solution algorithms for solving a constrained optimization problem. One approach is to convert a constrained problem into a series of unconstrained problems. Furthermore, unconstrained solution algorithms can be used as part of the constrained solution algorithms. Structural optimization is an iterative process where one starts with an initial design, a finite element structure analysis is then performed to calculate the response of the system (such as displacements, stresses, eigenvalues, etc.). Based upon the sensitivity information on the objective and constraint functions, an optimizer such as ADS or IDESIGN, can be used to find the new, improved design. For the structural analysis phase, the equation solver for the system of simultaneous, linear equations plays a key role since it is needed for either static, or eigenvalue, or dynamic analysis. For practical, large-scale structural analysis-synthesis applications, computational time can be excessively large. Thus, it is necessary to have a new structural analysis-synthesis code which employs new solution algorithms to exploit both parallel and vector capabilities offered by modern, high performance computers such as the Convex, Cray-2 and Cray-YMP computers. The objective of this research project is, therefore, to incorporate the latest development in the parallel-vector equation solver, PVSOLVE into the widely popular finite-element production code, such as the SAP-4. Furthermore, several nonlinear unconstrained optimization subroutines have also been developed and tested under a parallel computer environment. The unconstrained optimization subroutines are not only useful in their own right, but they can also be incorporated into a more popular constrained optimization code, such as ADS. Author

N92-27974*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DEVELOPMENT OF A TRUSS JOINT FOR ROBOTIC ASSEMBLY OF SPACE STRUCTURES
George F. Parma Jul. 1992 31 p
(RTOP 472-46-07-17)
(NASA-TP-3214; S-763; NAS 1.60:3214) Avail: NTIS HC/MF A03

This report presents the results of a detailed study of mechanical fasteners which were designed to facilitate robotic assembly of structures. Design requirements for robotic structural assembly were developed, taking into account structural properties and overall system design, and four candidate fasteners were designed to meet them. These fasteners were built and evaluated in the laboratory, and the Hammer-Head joint was chosen as superior overall. It had a high reliability of fastening under misalignments of 2.54 mm (0.1 in) and 3 deg, the highest end fixity (2.18), the simplest end effector, an integral capture guide, good visual verification, and the lightest weight (782 g, 1.72 lb). The study found that a good design should incorporate chamfers sliding on chamfers, cylinders sliding on chamfers, and hard surface finishes on sliding surfaces. The study also comments on robot flexibility, sag, hysteresis, thermal expansion, and friction which were observed during the testing. Author

N92-28041# Westinghouse Savannah River Co., Aiken, SC.
EVALUATION OF THE CAPACITY OF WELDED ATTACHMENTS TO ELBOWS AS COMPARED TO THE METHODOLOGY OF ASME CODE CASE N-318
G. B. Rawls, E. A. Wais (Wais, E. A. and Associates, Inc., Atlanta, GA), and E. C. Rodabaugh 1992 15 p Presented at the ASME Pressure Vessel and Piping Conference, New Orleans, LA, 21-25 Jun. 1992
(Contract DE-AC09-89SR-18035)
(DE92-009408; WSRC-MS-91-420; CONF-920631-13) Avail: NTIS HC/MF A03

This paper presents the results of a series of tests conducted to assess the capacity of various configurations of integral welded attachments. These tests are unique in that the attachments are welded to the outer radius of pipe elbows. The lug configurations tested include both rectangular and cross (cruciform) shapes. Both limit load and fatigue tests are performed on the lug-elbow configurations. The results of the limit load tests are presented as limit moments. The results of the fatigue tests are cycles-to-failure. Markl's equation is then used, with the fatigue results, to determine stress intensification factors. The limit moments and stress intensification factors are then compared to those developed using the methodology of ASME Code Case N-318. The level of conservatism in the Code Case methodology is then compared to the test results. DOE

N92-28138# California Univ., San Diego, La Jolla.
FABRIC-STRESS-DEFORMATION RELATIONS IN GRANULAR MATERIALS Final Report, 1 Oct. 1986 - 30 Jun. 1991
S. Nemat-Nasser 1 Dec. 1991 206 p
(Grant AF-AFOSR-0079-87)
(AD-A247009; AFOSR-92-0120TR) Avail: NTIS HC/MF A10

The basic aims of this research program were to study the mechanical properties and constitutive relations of granular materials that support the applied loads through interparticular frictional contacts, and to relate these to the granular fabric, both stress-induced and inherent. To this end a coordinated experimental and theoretical program was followed in order to identify the following: (1) effective parameters that measure the fabric of granular masses; (2) the difference between inherent and induced fabric, and the influence of each on the constitutive response of the material; (3) parameters which measure the evolution of fabric in the course of a given overall load or deformation history; (4) the relation between fabric and the overall stress and deformation; and (5) constitutive relations which directly involve fabric measures and the measure of their evolution, and hence, are based on the fundamental n-microstructural events which give rise to nonlinear material response. GRA

N92-28158# Toronto Univ. (Ontario).
DUAL WAVELENGTH FIBER-OPTIC POLARIMETER FOR PATH-INTEGRATED STRAIN SENSING: APPLICATION TO THE MEASUREMENT OF LOCAL SLOPE ON A FLEXIBLE BEAM Ph.D. Thesis
Roderick David Turner 10 Oct. 1990 276 p
(ISBN-0-315-59931-6; CTN-92-60469) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Recent applications for in-situ structural behavior monitoring include robotic and satellite shape sensing. An all optical fiber polarimetric sensor system was developed and characterized for applications in structural strain measurement. Laser diode optical sources were operated at multiple wavelengths to achieve interferometric quadrature, and hence provide a linear sensor strain response. The system represents the first all-fiber, dual wavelength, single-ended polarimetric sensor. System behavior for path-integral strain measurements under DC conditions was determined for two sensors of length 18.4 and 102 cm, surface adhered to aluminum cantilever beams. The longer sensor was tested under AC conditions (up to 14 Hz second mode of beam vibration) as a novel direction of pointing or point slope measurement device. The sensor responded linearly to changes in the relative orientation of its endpoints, as predicted by theory. Excellent angular tracking to +/-1 deg of orientation change, with a resolution of less than or equal 0.02 deg, was demonstrated. A comprehensive theoretical discussion of the polarimetric sensor's behavior is presented, taking into account the effects of strain, temperature and wavelength. A detailed analysis of the limitations of the sensor system is included, and recommendations are made as to the optimum practical implementation of the sensor for real applications.
Author (CISTI)

N92-28178# Wisconsin Univ., Madison. Center for Mathematical Sciences.
NONLINEAR ANALYSIS TECHNIQUES FOR SHEAR BAND FORMATIONS AT HIGH STRAIN-RATES Technical Summary Report
Athanasios E. Tzavaras Apr. 1992 26 p

(Contract DAAL03-88-K-0185)
(AD-A248584; CMS-TSR-92-10) Avail: NTIS HC/MF A03

One of the most striking manifestations of instability in solid mechanics is the localization of shear strain into narrow bands during high speed, plastic deformations of metals. According to one theory, the formation of shear bands is attributed to effective strain-softening response, which results at high strain rates as the net outcome of the influence of thermal softening on the, normally, strain-hardening response of metals. Our objective is to review some of the insight obtained by applying nonlinear analysis techniques on simple models of nonlinear partial differential equations simulating this scenario for instability. First, we take up a simple system, intended as a paradigm, that describes isothermal shear deformations of a material exhibiting strain softening and strain-rate sensitivity. As it turns out, for moderate amounts of strain softening, strain-rate sensitivity exerts a dissipative effect and stabilizes the motion. However, once a threshold is exceeded, the response becomes unstable and shear strain localization occurs. Next, we present extensions of these results to situations where explicit thermal effects are taken into account. GRA

N92-28214# Los Alamos National Lab., NM.
RECONSTRUCTION BASED ON FLEXIBLE PRIOR MODELS
K. M. Hanson 1992 10 p Presented at the 6th SPIE Conference on Medical Imaging, Newport Beach, CA, 23-28 Feb. 1992
(Contract W-7405-eng-36)
(DE92-011263; LA-UR-92-829; CONF-920298-1) Avail: NTIS HC/MF A02

A new approach to Bayesian reconstruction is introduced in which the prior probability distribution is endowed with an inherent geometrical flexibility. This flexibility is achieved through a warping of the coordinate system of the prior distribution into that of the reconstruction. This warping allows various degrees of mismatch between the assumed prior distribution and the actual distribution corresponding to the available measurements. The extent of the mismatch is readily controlled through constraints placed on the warp parameters. DOE

N92-27800*# Bath Univ. (England). School of Mechanical Engineering.
AN EVALUATION OF SOME STRATEGIES FOR VIBRATION CONTROL OF FLEXIBLE ROTORS
C. R. Burrows *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 691-705 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N92-27214# Naval Postgraduate School, Monterey, CA.
SATELLITE IMAGE DISPLAY AND PROCESSING WITH MICROCOMPUTERS: A PROOF-OF-CONCEPT FOR THE NAVY OCEANOGRAPHIC DATA DISTRIBUTION SYSTEM (NODDS) M.S. Thesis
Don T. Conlee Jun. 1991 56 p
(AD-A247247) Avail: NTIS HC/MF A04

The capabilities of small, primarily single-user computers have increased to the point where serious attention to the use of these systems as image display and processing stations is warranted. The addition of satellite display and processing to the existing Navy Oceanographic Data Distribution System (NODDS) can represent significant enhancement to the forecasting mission of Naval Oceanography Command Detachments and Facilities. This thesis outlines and demonstrates an approach to adding image functions to NODDS. Software has been written to display Defense Meteorological Satellite Program (DMSP) visual and infrared images within the NODDS software environment. Routines have also been developed to provide enhancement of the imagery. The requirements for communicating the imagery are addressed and supported by the testing of image transfer times. Finally, plans for system improvement and operational implementation are discussed. GRA

N92-27408# Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.).
ERS-1, THE EUROPEAN REMOTE SENSING SATELLITE: A CENTRAL POINT OF THE GERMAN EARTH OBSERVATION PROGRAM [ERS-1, EUROPAEISCHER FERNERKUNDUNGSSATELLIT: EIN SCHWERPUNKT DES DEUTSCHEN ERDBEOBACHTUNGSPROGRAMMS]
25 Apr. 1991 17 p In GERMAN
(Rept-14/91; ETN-92-90832) Avail: NTIS HC/MF A03

ERS-1 and its main tasks are presented. An Ariane 4 rocket is in charge of ERS-1 launching. The ESA control center is responsible for the management of the three year mission. The main tasks are reviewed: oceanography, ocean and atmosphere correlations, and geodesy. Payloads and instruments are described: the active microwave instrument, the radar altimeter, the along track scanning radiometer, the Precise Range And Range rate Equipment (PRARE), and the laser retroreflector. Costs and missions objectives are reported. ESA

N92-27543*# Nebraska Univ., Lincoln. Dept. of Agricultural Meteorology.
[ANALYSIS OF SOIL AND SPECIES COMPOSITION] Final Technical Report, 15 Apr. 1987 - 31 Jan. 1992
Shashi B. Verma 5 Mar. 1992 16 p
(Grant NAG5-890)
(NASA-CR-190065; NAS 1.26:190065) Avail: NTIS HC/MF A03

Measurements were made during May to October, 1987 and June to August, 1989 over a tallgrass prairie near Manhattan, Kansas. Soil at the experimental site is predominantly Dwight silty clay loam. The prairie was burned on 16 April 1987 and on 28 April 1989 to improve the mix of grasses and forbs. The experimental area was not grazed during 1986 - 1989. A summary of results are given for soil moisture and plant growth; momentum flux and canopy aerodynamic characteristics; evapotranspiration, components of energy balance and canopy conductance; modeling canopy stomatal conductance; canopy photosynthesis, photosynthetic efficiency and water use efficiency; modeling canopy photosynthesis; the carbon dioxide budget in a temperate grassland ecosystem; and photosynthesis and stomatal conductance related to reflectance on the canopy scale. Author

N92-27554# Defense Mapping Agency Hydrographic and Topographic Center, Washington, DC.
DATUMS, ELLIPSOIDS, GRIDS, AND GRID REFERENCE SYSTEMS Final Report
John W. Hager, Larry L. Fry, Sandra S. Jacks, and David R. Hill 1992 162 p
(AD-A247651; DMA-TM-8358.1) Avail: NTIS HC/MF A08

This manual describes the basic principles of the Military Grid Reference System and the non-standard reference systems. It describes the method for determining references on maps and charts at scales of 1:1,000,000 and larger. It contains identifications for the grid zone designations and for the 100,000 meter squares of the Universal Transverse Mercator Grid and the Universal Polar

Stereographic Grid. It also contains the specifications and grid identifications for the various non-standard grids. It provides diagrams and textual information for delineating geodetic datums and ellipsoids. GRA

N92-27559*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
EXPERIMENTAL MEASUREMENT AND THEORETICAL MODELING OF MICROWAVE SCATTERING AND THE STRUCTURE OF THE SEA SURFACE INFLUENCING RADAR OBSERVATIONS FROM SPACE Semiannual Report, 1 Oct. 1991 - 1 Apr. 1992
David Arnold and J. A. Kong 1 Apr. 1992 28 p
(Grant NAGw-1272)
(NASA-CR-190427; NAS 1.26:190427; OSP-70391) Avail: NTIS HC/MF A03

The electromagnetic bias is an error present in radar altimetry of the ocean due to the non-uniform reflection from wave troughs and crests. A study of the electromagnetic bias became necessary to permit error reduction in mean sea level measurements of satellite radar altimeters. Satellite radar altimeters have been used to find the upper and lower bounds for the electromagnetic bias. This report will present a theory using physical optics scattering and an empirical model of the short wave modulation to predict the electromagnetic bias. The predicted electromagnetic bias will be compared to measurements at C and Ku bands. H.A.

N92-27881# Environmental Research Inst. of Michigan, Ann Arbor.
REMOTE SENSING FOR MATERIAL IDENTIFICATION UNDER SPACE UMBRELLA Final Report, Nov. 1990 - Dec. 1991
Larry Reed, Norm Roller, Russell Sieron, John Sikora, and Lynnette Wood 31 Jan. 1992 35 p Prepared for Battelle Columbus Labs., OH
(Contract F33657-88-D-0076)
(AD-A247000) Avail: NTIS HC/MF A03

The objective of the Remote Sensing for Material Identifications effort was to improve the understanding of the Foreign Aerospace Science and Technology Center (FASTC) in the exploitation of multispectral data. A one-week multispectral exploitation course, with emphasis on material identification, was prepared and conducted at ERIM's Ann Arbor facilities. Follow-up consultation and support focused on a study to determine how current and planned ERIM multispectral exploitation software tools, with emphasis on change detection, could be migrated to planned FASTC systems. GRA

N92-28013*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS OF THE THIRD AIRBORNE SYNTHETIC APERTURE RADAR (AIRSAR) WORKSHOP
Jakob J. vanZyl, ed. 1 Aug. 1991 242 p Workshop held in Pasadena, CA, 23-24 May 1991 Contains color slides as supplement
(Contract NAS7-918; RTOP 665-31-00-08-71)
(NASA-CR-190461; JPL-Publ-91-30; NAS 1.26:190461) Avail: NTIS HC/MF A11

The Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop was held on 23-24 May 1991 at JPL. Thirty oral presentations were made and 18 poster papers displayed during the workshop. Papers from these 25 presentations are presented which include analyses of AIRSAR operations and studies in SAR remote sensing, ecology, hydrology, soil science, geology, oceanography, volcanology, and SAR mapping and data handling. Results from these studies indicate the direction and emphasis of future orbital radar-sensor missions that will be launched during the 1990's. For individual titles, see N92-28014 through N92-28038.

N92-28014*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
PROGRESS TOWARDS SAR BASED ECOSYSTEM ANALYSIS
K. Jon Ranson and Guoqing Sun (Ressler Associates, Inc., Laurel, MD.) *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 1-10 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

Recent progress towards a synthetic aperture radar (SAR) based system for determining forest ecosystem attributes is discussed. Our SAR data processing and analysis sequence, from calibration through classification, is described. In addition, the usefulness of SAR image data for identifying ecosystem classes is discussed. Author

N92-28015*# Environmental Research Inst. of Michigan, Ann Arbor.
THE RELATIONSHIP BETWEEN ABOVEGROUND BIOMASS AND RADAR BACKSCATTER AS OBSERVED ON AIRBORNE SAR IMAGERY
Eric S. Kasischke, Laura L. Bourgeau-Chavez, Norman L. Christensen, Jr., and M. Craig Dobson (Michigan Univ., Ann Arbor.) *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 11-21 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

The initial results of an experiment to examine the dependence of radar image intensity on total above-ground biomass in a southern US pine forest ecosystem are presented. Two sets of data are discussed. First, we examine two L-band (VV-polarization) data sets which were collected 5 years apart. These data sets clearly illustrate the change in backscatter resulting from the growth of a young pine stand. Second, we examine the dependence between radar backscatter and biomass as a function of radar frequency using data from the JPL Airborne Synthetic Aperture Radar (AIRSAR) and ERIM/NADC P-3 SAR systems. These results show that there is a positive correlation between above-ground biomass and radar backscatter and at C-, L-, and P-bands, but very little correlation at C-band. The biomass level for which this positive correlation holds decreases as radar frequency increases. This positive correlation is stronger at HH and HV polarizations that VV polarization at L- and P-bands, but strongest at VV polarization for C-band. Author

N92-28016*# Environmental Research Inst. of Michigan, Ann Arbor.
ANALYSIS OF POLARIMETRIC SAR SIGNATURES OF VEGETATED AREAS
Nancy H. F. French, Laura L. Bourgeau-Chavez, Eric S. Kasischke, and Daniel R. Sheen *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 22-33 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

Several techniques to quantitatively analyze the information in the polarimetric signature are discussed, including: (1) a shape (texture) parameter; (2) fractional polarization; (3) the phase difference signature; and (4) the correlation coefficient. These techniques are applied to airborne synthetic aperture radar imagery collected over several different vegetation communities, including a mangrove swamp, a mixed-age loblolly pine forest, and a flooded bald cypress forest. Author

N92-28017*# Michigan Univ., Ann Arbor.
RELATING THE TEMPORAL CHANGE OBSERVED BY AIRSAR TO SURFACE AND CANOPY PROPERTIES OF MIXED CONIFER AND HARDWOOD FORESTS OF NORTHERN MICHIGAN
M. Craig Dobson, Kyle McDonald, Fawwaz T. Ulaby, and Terry Sharik (Michigan Technological Univ., Houghton.) *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 34-43 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

The mixed hardwood and conifer forests of northern Michigan were overflown by a 3-frequency airborne imaging radar in Apr. and Jul. 1990. A set of 10 x 10 km test sites near the University of Michigan Biological Station at Douglas Lake and within the

Hiawatha National Forest in the upper peninsula of Michigan contained training stands representing the various forest species typical of forest communities across the ecotone between the coniferous boreal forest and mid-latitude hardwood and coniferous forests. The polarimetric radar data were externally calibrated to allow interdate comparisons. The Apr. flight was prior to bud-break of deciduous species and patchy snowcover was present. The Jul. flights occurred during and 2 days after heavy rain showers, and provide a unique opportunity to examine the differences in radar backscatter attributable to intercepted precipitation. Analyses show that there are significant changes in backscattering between biophysically dissimilar forest stands on any given date and also between dates for a given forest stand. These differences in backscattering can be related to moisture properties of the forest floor and the overlying canopy and also to the quantity and organizational structure of the above-ground biomass. Author

N92-28018*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MULTI-FREQUENCY AND POLARIMETRIC RADAR BACKSCATTER SIGNATURES FOR DISCRIMINATION BETWEEN AGRICULTURAL CROPS AT THE FLEVOLAND EXPERIMENTAL TEST SITE

A. Freeman, J. Villasenor, and J. D. Klein *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 44-56 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

We describe the calibration and analysis of multi-frequency, multi-polarization radar backscatter signatures over an agriculture test site in the Netherlands. The calibration procedure involved two stages: in the first stage, polarimetric and radiometric calibrations (ignoring noise) were carried out using square-base trihedral corner reflector signatures and some properties of the clutter background. In the second stage, a novel algorithm was used to estimate the noise level in the polarimetric data channels by using the measured signature of an idealized rough surface with Bragg scattering (the ocean in this case). This estimated noise level was then used to correct the measured backscatter signatures from the agriculture fields. We examine the significance of several key parameters extracted from the calibrated and noise-corrected backscatter signatures. The significance is assessed in terms of the ability to uniquely separate among classes from 13 different backscatter types selected from the test site data, including eleven different crops, one forest and one ocean area. Using the parameters with the highest separation for a given class, we use a hierarchical algorithm to classify the entire image. We find that many classes, including ocean, forest, potato, and beet, can be identified with high reliability, while the classes for which no single parameter exhibits sufficient separation have higher rates of misclassification. We expect that modified decision criteria involving simultaneous consideration of several parameters increase performance for these classes. Author

N92-28019*# Canada Centre for Remote Sensing, Ottawa (Ontario).

MULTI-POLARIZATION C-BAND SAR FOR SOIL MOISTURE ESTIMATION

R. J. Brown and B. Brisco (INTERA Technologies Ltd., Nepean, Ontario) *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 57-67 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

Previous studies of synthetic aperture radar (SAR) imagery have shown qualitative relationships between radar backscatter and soil moisture. However, to be able to use these data in operational programs it will be necessary to establish quantitatively how the radar return is related to soil moisture and the effects of surface roughness, soil type, and vegetation cover and growth stage, as a function of frequency and polarization. To this end, a multi-year experiment began in 1990 as a cooperative venture amongst the Canada Center (Agriculture Canada), and the Universities of Guelph, Sherbrooke, Laval, and Waterloo. During 1990, SAR imagery was acquired during two periods (May and Jun.) to correspond to times of minimal and substantial vegetation cover. SAR data were acquired on three days in May and on four days in Jul. to cover different soil moisture conditions. This unique comprehensive data set is used to investigate the relationships between soil moisture and radar backscatter. The experiment and data collected are described, and a preliminary qualitative interpretation of the relationship between soil moisture and image tone is provided. Author

N92-28020*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

SOIL MOISTURE MEASUREMENTS FROM AIRBORNE SAR

Jiancheng Shi, Joao V. Soares, Laura Hess, Edwin T. Engman, and Jakob J. vanZyl (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 68-77 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

The preliminary results of algorithm development and testing for soil moisture retrieval at high incidence angles are reported. Based on first-order surface backscattering models, a physically based algorithm for retrieval of soil moisture was developed and evaluated using NASA/JPL aircraft synthetic aperture radar (SAR) data. It shows that the copolarization ratio is sensitive to soil moisture change but not to surface roughness at high incidence angles. This algorithm performed well at L-band and should be useful. This study suggests that incidence angles greater than 40 degrees are optimal for such monitoring. Author

N92-28021*# California Univ., Santa Barbara. Center for Remote Sensing and Environmental Optics.

SNOW AND GLACIER MAPPING WITH POLARIMETRIC SAR

Jiancheng Shi, Jeff Dozier, Helmut Rott, and Robert E. Davis (Army Cold Regions Research and Engineering Lab., Hanover, NH.) *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 78-87 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

The objective of this study was to examine the capability of mapping snow and glaciers in alpine regions using synthetic aperture radar (SAR) imagery when topographic information is not available. The topographic effects on the received power for a resolution cell can be explained by the change in illumination area and incidence angle in a slant-rante representation of SAR imagery. The specific polarization signatures and phase difference between HH and VV components are relatively independent of the illuminated are, and the incidence angle has only a small effect on these parameters. They provide a suitable measurement data set for snow and glacier mapping in a high-relief area. The results show that the C-band images of the enhancement factor, the phase difference between HH and VV scattering components, and the normalized cross product of VV scattering elements provide the capability to discriminate among snow with different wetnesses, glaciers, and rocky regions. Author

N92-28022*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MONSOON 1990: PRELIMINARY SAR RESULTS

Jakob J. vanZyl, Pascale Dubois, and Abel Guerra *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 88-97 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

Multifrequency polarimetric synthetic aperture radar (SAR) images of the Walnut Gulch watershed near Tombstone, Arizona were acquired on 28 Mar. 1990 and on 1 Aug. 1990. Trihedral corner reflectors were deployed prior to both overflights to allow calibration of the two SAR data sets. During both overflights, gravimetric soil moisture and dielectric constant measurements were made. Detailed vegetation height, density, and water content measurements were made as part of the Monsoon 1990 Experiment. Preliminary results based on analysis of the

multitemporal polarimetric SAR data are presented. Only the C-band data (5.7-cm wavelength) radar images show significant difference between Mar. and Aug., with the strongest difference observed in the HV images. Based on the radar data analysis and the in situ measurements, we conclude that these differences are mainly due to changes in the vegetation and not due to the soil moisture changes. Author

N92-28023*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AIRSAR OBSERVATIONS OF THE GULF STREAM WITH INTERPRETATION FROM SEA TRUTH AND MODELING c48
G. R. Valenzuela, S. R. Chubb, G. O. Marmorino, C. L. Trump, J. S. Lee, A. L. Cooper, F. Askari, W. C. Keller, J. A. C. Kaiser, and R. P. Mied (Naval Research Lab., Washington, DC.) et al *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 98-108 Prepared in cooperation with NADC, Warminster, PA, North Carolina State Univ., Raleigh, ERIM, Ann Arbor, David Taylor Research Center, Bethesda, MD, Naval Oceanographic and Atmospheric Research Lab., Bay Saint Louis, MS, Univ. of Southern Mississippi, Bay Saint Louis, and JHU, Laurel, MD (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

On 20 Jul., JPL/DC-8 synthetic aperture radar (SAR) participated in the 17-21 Jul. 1990 NRL Gulf Stream (GS) experiment in preparation for SIR-C missions in 1993, 1994, and 1996 for calibration purposes and to check modes and techniques for operation at our experimental site off the east coast of the US. During this experiment, coordinated and near simultaneous measurements were performed from ship (R/V Cape Henlopen) and other aircraft (NADC/P-3 and NRL/P-3) to address scientific questions relating to the origin of 'slick-like' features observed by Scully-Power, the refraction and modulation of waves by variable currents, the effect of current and thermal fronts on radar imagery signatures and the modification of Kelvin ship wakes by fronts. The JPL/DC-8 and NADC/P-3 SAR's are fully polarimetric systems. Their composite frequency range varies between P- and X-band. We describe in detail the Airborne SAR (AIRSAR) participation in the Jul. 1990 GS experiment and present preliminary results of the ongoing analysis and interpretation of the radar imagery in the context of ground truth, other remote measurements, and modeling efforts. Author

N92-28024*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DUAL FREQUENCY ALONG-TRACK INTERFEROMETRY Status Report c32
R. E. Carande, R. M. Goldstein, Y. Lou, T. Miller, and K. Wheeler *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 109-116 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

In recent months, the JPL Airborne Synthetic Aperture Radar (AIRSAR) System has had a C-band Along-Track Interferometer installed. This, in addition to the L-band interferometer already operating in the system, makes it possible to simultaneously acquire two frequency interferometer data. Also, another upgrade involving the radar digital system allows each interferometer to be operated in such a way as to obtain two along-track interferometric baselines differing by a factor of 2 in length. An engineering checkout flight has demonstrated the ability to acquire and process both frequencies to high-resolution velocity maps of the ocean surface. The status of these interferometers and some initial data are presented. Author

N92-28025*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POLARIZATION SIGNATURES FOR ABANDONED AGRICULTURAL FIELDS IN THE MANIX BASIN AREA OF THE MOJAVE DESERT c32
Terrill W. Ray (California Inst. of Tech., Pasadena.), Tom G. Farr, and Jakob J. vanZyl *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 117-125 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

Polarimetric signatures from abandoned circular alfalfa fields in the Manix Basin area of the Mojave desert show systematic changes with length of abandonment. The obliteration of circular planting rows by surface processes could account for the disappearance of bright 'spokes', which seems to be reflection patterns from remnants of the planting rows, with increasing length of abandonment. An observed shift in the location of the maximum L-band copolarization return away from VV, as well as an increase in surface roughness, both occurring with increasing age of abandonment, seems to be attributable to the formation of wind ripple on the relatively vegetationless fields. A Late Pleistocene/Holocene sand bar deposit, which can be identified in the radar images, is probably responsible for the failure of three fields to match the age sequence patterns in roughness and peak shift. Author

N92-28026*# Colorado Univ., Boulder. Center for the Study of Earth from Space.
GEOLOGIC MAPPING IN DEATH VALLEY, CALIFORNIA/NEVADA USING NASA/JPL AIRBORNE SYSTEMS (AVIRIS, TIMS, AND AIRSAR) Abstract Only
Fred A. Kruse, John B. Dietz, and Kathryn S. KiereinYoung *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 126-127 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

A multi-sensor aircraft campaign called the Geologic Remote Sensing Field Experiment (GRSFE) conducted during 1989 resulted in acquisition of high quality multispectral images in the visible, near infrared, shortwave infrared, thermal infrared, and microwave regions of the electromagnetic spectrum. The airborne data sets include the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS), the Thermal Infrared Multispectral Scanner (TIMS), and the Airborne Synthetic Aperture Radar (SAR). Ancillary data include Landsat Thematic Mapper, laboratory and field spectral measurements, and traditional geologic mapping. The GRSFE data for a site in the northern Death Valley, (California and Nevada) region were calibrated to physical units and geometrically registered to a map base. Various aspects of this experiment are briefly discussed. Author

N92-28027*# Cornell Univ., Ithaca, NY. Dept. of Geological Sciences.
AIRBORNE SAR DETERMINATION OF RELATIVE AGES OF WALKER VALLEY MORAINES, EASTERN SIERRA NEVADA Abstract Only
A. Fox, B. Isacks, A. Bloom, E. Fielding, and D. McMurry *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 128 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

A regional study of the distribution and elevations of Pleistocene moraines in the Andes requires a method of determining relative age from space. One of our primary objectives is to establish the relative chronology of major climatic events responsible for glaciation in the Andes and other regions that are difficult to access on the ground and where suitable material for absolute age determination is lacking. The sensitivity of radar to surface roughness makes it possible to develop a remotely-based relative dating technique for landforms for which surface age and roughness can be correlated. We are developing such a technique with Airborne Synthetic Aperture Radar (AIRSAR) imagery of the eastern Sierra Nevada where independent evidence is available for the ages and physical characteristics of moraines. The Sierra Nevada moraines are similar in form and environmental setting to Andean moraines that we have targeted for study during the pending Shuttle Imaging Radar-C (SIR-C) mission. SAR imagery is used to differentiate the ages of five moraine sequences of Walker Valley in the eastern Sierra Nevada. Other aspects of this investigation are briefly discussed. Author

N92-28028*# Commission of the European Communities, Ispra (Italy). Inst. for Remote Sensing Applications.
MAESTRO1 DATA SET CALIBRATION: THE JRC APPROACH
C. Lavalle, G. DeGrandi, H. DeGroof, and A. J. Sieber *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 129-137 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

Calibration is a fundamental task for analysis. Therefore, the Microwave Team of the JRC Ispra has put considerable effort investigating and checking the different calibration techniques, using the data collected during the MAESTRO1 campaign. We report on this activity. First, we give an overview of the algorithms used for phase and radiometric calibration. Then, we describe the software tools that were developed to support the calibration data processing. Finally, we present and discuss the results obtained from the calibration in the test sites of Freiburg and Flevoland.
Author

N92-28029*# Sheffield Univ. (England).
SAR CALIBRATION AND PRINCIPAL COMPONENT ANALYSIS **c32**
S. Quegan and L. V. Dutra (Instituto de Pesquisas Espaciais, Sao Paulo, Brazil) *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 138-146 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

Principal components analysis of ideal, complex quadpolarized synthetic aperture data tells us how the information is encoded in the eigenstructure of the data from homogeneous, distributed targets. Comparison with real data indicates distortion of the correlation matrices by system effects. The implications for measurement of the terms in the true correlation matrix are displayed. These are related to how accurately we can make inferences about the products of principle components analysis.
Author

N92-28030*# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (Germany, F.R.). Inst. for Radio Frequency Technology.
RESULTS OF THE 1989 SAR CALIBRATION EXPERIMENT AT OBERPFAFFENHOFEN **c32**
M. Zink *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 147-156 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

Results from the 1989 Airborne Synthetic Aperture Radar (SAR) Calibration Campaign at the DLR test site in Oberpfaffenhofen are presented. Passive corner reflectors were used to derive the receiver and transmitter distortion matrices and the absolute calibration factor of the multispectral polarimetric DC-8 SAR from the complex high resolution data. A basic requirement for cross-calibration of data from different tracks is the stability of the SAR system. The polarimetric properties of the uncalibrated data were used to describe this stability. Quality criteria for a successful polarimetric calibration were provided by the channel balance and cross-talk parameters.
Author

N92-28031*# Massachusetts Inst. of Tech., Cambridge. Electronics Research Lab.
EXTERNAL CALIBRATION OF POLARIMETRIC RADARS USING POINT AND DISTRIBUTED TARGETS **c32**
S. H. Yueh, J. A. Kong, and R. T. Shin *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 157-166 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

Polarimetric calibration algorithms using combinations of point targets and reciprocal distributed targets are developed. From the reciprocity relations of distributed targets, and equivalent point target response is derived. Then the problem of polarimetric calibration using two point targets and one distributed target reduces to that using three point targets, which has been previously solved. For calibration using one point target and one reciprocal distributed target, two cases are analyzed with the point target being a trihedral reflector or a polarimetric active radar calibrator (PARC). For both cases, the general solutions of the system distortion matrices are written as a product of a particular solution and a matrix with one free parameter. For the trihedral-reflector case, this free parameter is determined by assuming azimuthal symmetry for the distributed target. For the PARC case, knowledge of one ratio of two covariance matrix elements of the distributed target is required to solve for the free parameter. Numerical results are simulated to demonstrate the usefulness of the developed algorithms.
Author

N92-28032*# Michigan Univ., Ann Arbor. Radiation Lab.
CALIBRATION OF A POLARIMETRIC IMAGING SAR **c32**
K. Sarabandi, L. E. Pierce, and F. T. Ulaby *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 167-176 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

Calibration of polarimetric imaging Synthetic Aperture Radars (SAR's) using point calibration targets is discussed. The four-port network calibration technique is used to describe the radar error model. The polarimetric ambiguity function of the SAR is then found using a single point target, namely a trihedral corner reflector. Based on this, an estimate for the backscattering coefficient of the terrain is found by a deconvolution process. A radar image taken by the JPL Airborne SAR (AIRSAR) is used for verification of the deconvolution calibration method. The calibrated responses of point targets in the image are compared both with theory and the POLCAL technique. Also, response of a distributed target are compared using the deconvolution and POLCAL techniques.
Author

N92-28033*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INFORMATION CONTENT OF POLARIMETRIC SAR DATA **c32**
Ian G. Cumming, David L. Small (British Columbia Univ., Vancouver.), and Jakob J. vanZyl *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 177-186 Sponsored by the Province of British Columbia Science Council GREAT Award Program and the Canadian Natural Sciences and Engineering Research Council (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

The information content of the compressed Stoke's matrix data from the Airborne Synthetic Aperture Radar (AIRSAR) is examined in two ways - by measuring how each feature separates classes of terrain in an image, and by measuring how well a classifier performs with and without each feature. In this way, the features may then be ranked in order of information content (or in order of utility to the classifier). Suggestions are made regarding those variables that can be omitted in a data compression scheme or in a future simplified radar system.
Author

N92-28034*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE AIRSAR IMAGE BROWSE SYSTEM **c32**
A. Pang, L. Nguyen, and R. Kwok *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 187-194 (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

The volume of data acquired by synthetic aperture radar (SAR) missions motivates the development of a technique that will provide investigators with timely access to image data, and the capability to visually inspect images to determine various characteristics of the data collected, as well as the extent of the data coverage. A system was designed for accessing and browsing an on-line archive of NASA Airborne SAR (AIRSAR) imagery and is being developed as an extension to the SAR Data Catalog System (SDCS). The AIRSAR browse system consists of three elements: (1) an on-line,

compressed imagery archive; (2) a user interface for selecting and accessing the on-line images; and (3) a software application program for reconstructuring and displaying the images. Details of these elements are described. The goals are to maximize the utilization of the AIRSAR data set, and to demonstrate the image browse concept for SAR data so that baseline catalog systems supporting SIR-C and future SAR missions will feature this capability. Author

N92-28035*# Commission of the European Communities, Ispra (Italy). Inst. of Remote Sensing Applications-Advanced Technologies.

GEOMETRIC RECTIFICATION AND GEOCODING OF JPL'S AIRSAR DATA OVER HILLY TERRAIN **c32**

H. DeGroof, G. DeGrandi, and A. J. Sieber *In* JPL, Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 195-204 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

A post-processing system was developed to georeference and geocode airborne synthetic aperture radar (SAR) data collected by the JPL-Airborne SAR (AIRSAR) System over hilly terrain during the 1990 MAESTRO1 campaign. Georectification relates image coordinates and object coordinates while the geocoding involves resampling. The georectification method uses a hybrid method based upon a number of navigational parameters and minimal two ground-control points which are referenced in both image and map space. The calculation of the intersection of the SAR signal wavefront and a digital elevation model allowed, within certain error bounds, acquisition of the object-to-image and image-to-object relationships. Author

N92-28036*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

APPROACHES TO VEGETATION MAPPING AND ECOPHYSIOLOGICAL HYPOTHESIS TESTING USING COMBINED INFORMATION FROM TIMS, AVIRIS, AND AIRSAR

R. Oren, G. Vane, R. Zimmermann, V. Carrere, V. Realmuto, Howard A. Zebker, P. Schoeneberger, and M. Schoeneberger (Forest Service, Raleigh, NC.) *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 205-222 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

The Tropical Rainforest Ecology Experiment (TREE) had two primary objectives: (1) to design a method for mapping vegetation in tropical regions using remote sensing and determine whether the result improves on available vegetation maps; and (2) to test a specific hypothesis on plant/water relations. Both objectives were thought achievable with the combined information from the Thermal Infrared Multispectral Scanner (TIMS), Airborne Visible/Infrared Imaging Spectrometer (AVIRIS), and Airborne Synthetic Aperture Radar (AIRSAR). Implicitly, two additional objectives were: (1) to ascertain that the range within each variable potentially measurable with the three instruments is large enough in the site, relative to the sensitivity of the instruments, so that differences between ecological groups may be detectable; and (2) to determine the ability of the three systems to quantify different variables and sensitivities. We found that the ranges in values of foliar nitrogen concentration, water availability, stand structure and species composition, and plant/water relations were large, even within the upland broadleaf vegetation type. The range was larger when other vegetation types were considered. Unfortunately, cloud cover and navigation errors compromised the utility of the TIMS and AVIRIS data. Nevertheless, the AIRSAR data alone appear to have improved on the available vegetation map for the study area. An example from an area converted to a farm is given to demonstrate how the combined information from AIRSAR, TIMS, and AVIRIS can uniquely identify distinct classes of land use. The example alludes to the potential utility of the three instruments for identifying vegetation at an ecological scale finer than vegetation types. Author

N92-28037*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

POLARIMETRIC RADAR MEASUREMENTS OF A TROPICAL RAINFOREST

S. Durden, A. Freeman, J. Klein, G. Vane, H. Zebker, R. Zimmermann, and R. Oren (Duke Univ., Durham, NC.) *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 223-229 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

In Mar. 1990, the NASA/JPL DC-8 Airborne Synthetic Aperture Radar (AIRSAR) was flown over an area in northern Belize and the surrounding areas of Guatamala and Mexico. We have extracted the three-frequency polarimetric signatures of a variety of natural areas and have found that many appear to have a unique radar signature, if all polarizations and frequencies are examined. Author

N92-28038*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE TOPSAR INTERFEROMETRIC RADAR TOPOGRAPHIC MAPPING INSTRUMENT **c32**

Howard A. Zebker *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 230-233 (For primary document see N92-28013 18-43)

Avail: NTIS HC/MF A11

We have augmented the NASA DC-8 Airborne Synthetic Aperture Radar (AIRSAR) instrument with a pair of C-band antennas displaced across the track to form an interferometer sensitive to topographic variations of the Earth's surface. The antennas were developed by Alenia Spazio under the sponsorship of the Italian Space Agency (ASI), and the AIRSAR instrument and modifications to it supporting TOPSAR were sponsored by NASA. A new data processor was developed at JPL for producing the topographic maps. As of May 1991, one engineering flight line over San Francisco, CA was reduced to a cartographically rectified topographic map. Analysis of the results indicates that statistical errors are in the range of 2 to 4 m, while systematic effects due to aircraft motion are in the range of 6 to 12 m. Future aircraft motion compensation algorithms should reduce the systematic variations to near zero, while the statistical errors could likely be reduced to 2 m or less with some processor improvements. Author

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *28 Propellants and Fuels.*

N92-27392# Argonne National Lab., IL.

FINITE ELEMENT ANALYSIS OF MONOLITHIC SOLID OXIDE FUEL CELLS

A. Saigal (Tufts Univ., Medford, MA.) and S. Majumdar 1992 17 p Presented at the 1992 ANSYS Technology Conference, Pittsburgh, PA, 4-7 May 1992

(Contract W-31-109-eng-38)

(DE92-010515; ANL/CP-73835; CONF-9205129-1) Avail: NTIS HC/MF A03

This paper investigates the stress and fracture behavior of a monolithic solid oxide fuel cell (MSOFC) currently under joint development by Allied Signal Corporation and Argonne National Laboratory. The MSOFC is an all-ceramic fuel cell capable of high power density and tolerant of a variety of hydrocarbon fuels, making it potentially attractive for stationary utility and mobile transportation systems. The monolithic design eliminates inactive structural supports, increases active surface area, and lowers voltage losses caused by internal resistance. DOE

N92-27320*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE EFFECT OF THE LOW EARTH ORBIT ENVIRONMENT ON SPACE SOLAR CELLS: RESULTS OF THE ADVANCED PHOTOVOLTAIC EXPERIMENT (S0014) Abstract Only
David J. Brinker and John R. Hickey (Eppley Lab., Inc., Newport, RI.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 117 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27321*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LEO EFFECTS ON CANDIDATE SOLAR CELL COVER MATERIALS Abstract Only
Paul M. Stella *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 118 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27798*# Fare, Inc., College Park, MD.
DEVELOPMENT OF A DIFFERENTIALLY BALANCED MAGNETIC BEARING AND CONTROL SYSTEM FOR USE WITH A FLYWHEEL ENERGY STORAGE SYSTEM
Mark A. Higgins, David P. Plant, Douglas M. Ries, James A. Kirk, and Davinder K. Anand (Maryland Univ., College Park.) *In* NASA. Langley Research Center, International Symposium on Magnetic Suspension Technology, Part 2 May 1992 p 657-672 (For primary document see N92-27788 18-18)
Avail: NTIS HC/MF A20

45 ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

N92-27343# McGill Univ., Montreal (Quebec). Climate Research Group.
NSERC/AES INDUSTRIAL RESEARCH CHAIRS IN CLIMATE RESEARCH, MCGILL UNIVERSITY Annual Progress Report No. 3
Lawrence A. Mysak and Charles A. Lin Mar. 1989 14 p
(CRG-89-4; CTN-92-60536) Avail: NTIS HC/MF A03

The unifying theme of most of the work carried out at McGill University's Industrial Research Chair program in climate research is the role of oceans in climate. A major task of the program has been the development of a global upper-ocean circulation model which will be coupled to an atmospheric general circulation model (GCM) in order to yield a fully interactive atmosphere-ocean GCM suitable for conducting various numerical climate experiments and producing climate scenarios. Other research projects include those concerning various aspects of climate and atmospheric dynamics, including large scale air-ice-ocean interactions, long-term climatic fluctuations, heat transport by planetary waves, and isopycnal diffusion in the oceans. The program is also contributing toward manpower training to research associates, postdoctoral fellows, and graduate students. Research during 1988-89 is reviewed and a list of relevant publications is included. CISTI

N92-27359# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
THE OCEANS' ROLE IN CLIMATE VARIABILITY AND CLIMATE CHANGE
Lawrence A. Mysak and Charles A. Lin May 1989 43 p
Sponsored by Natural Sciences and Engineering Research Council; Atmospheric Environment Service; and FCAR
(CGCR-89-9; CTN-92-60540) Avail: NTIS HC/MF A03

In view of the significant impacts of climate change, the question of whether the warming trend induced by the greenhouse effect has actually been detected is addressed. Natural climatic variability over various time scales is first illustrated, such as those coinciding with El Nino events or with large atmospheric pressure gradients. The impacts of natural climatic variability on fisheries are reviewed. The long-term increase in atmospheric CO2 due to fossil fuel burning is noted along with the problems of forecasting atmospheric CO2 concentrations in the future. The modeling of greenhouse effect induced climatic change is discussed along with some results from coupled ocean-atmosphere models and their uncertainties. The detection of CO2 greenhouse warming requires a comparison of the temperature increase calculated by a climate model with the observed temperature trend. The observed global temperature changes indicated by meteorological records do show an upward trend but also show variations which cannot be explained by CO2 alone. Models have limitations such as their reliance on equilibrium conditions and their way of treating the time-dependent transient responses of the climate system. Some models show an increase due to greenhouse warming of between 0.2 and 0.6 C for the period up to 1980, which is too small to be able to distinguish the greenhouse warming trend from natural climatic fluctuations. CISTI

N92-27417# Lawrence Livermore National Lab., CA.
SENSITIVITY OF GLOBAL WARMING POTENTIALS TO THE ASSUMED BACKGROUND ATMOSPHERE
D. J. Wuebbles and K. O. Patten Mar. 1992 9 p
(Contract W-7405-eng-48)
(DE92-011072; UCRL-ID-109847) Avail: NTIS HC/MF A02

This is the first in a series of papers in which we will examine various aspects of the Global Warming Potential (GWP) concept and the sensitivity and uncertainties associated with the GWP values derived for the 1992 updated scientific assessment report of the Intergovernmental Panel on Climate Change (IPCC). One of the authors of this report helped formulate the GWP concept for the first IPCC report in 1990. The Global Warming Potential concept was developed for that report as an attempt to fulfill the request from policymakers for a way of relating the potential effects on climate from various greenhouse gases, in much the same way as the Ozone Depletion Potential (ODP) concept is used in policy analyses related to concerns about the relative effects of CFCs and other compounds on stratospheric ozone destruction. We are also coauthors of the section on radiative forcing and Global Warming Potentials for the 1992 IPCC update; however, there was too little time to prepare much in the way of new research material for that report. Nonetheless, we have recognized for some time that there are a number of uncertainties and limitations associated with the definition of GWPs used in both the original and new IPCC reports. In this paper, we examine one of those uncertainties, namely, the effect of the assumed background atmospheric concentrations on the derived GWPs. Later papers will examine the sensitivity of GWPs to other uncertainties and limitations in the current concept. DOE

N92-27426# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
REVIEW OF CLIMATIC FLUCTUATIONS ON THE CENTURY TIMESCALE
Thomas F. Stocker May 1989 71 p
(Grant SNSF-82.613.0.88)
(CGCR-89-7; CTN-92-60527) Avail: NTIS HC/MF A04

A review is presented of investigations of climatic variability on the century time scale that is observed in proxy-data records during the last 10,000 years. A number of proxy records with sufficient resolution on this time scale suggest the presence of cyclic variations with periods from 50 to 500 years. The cycles occur in oxygen isotope ratios, tree ring index series, glacier stands, and ice extents. They can also be identified in biological and historical records and in long term instrumental observations. In order to understand the century time scale cycles in the context of climatic variations in general, a brief history of Quaternary climate research, a summary of relevant proxy techniques, and a survey of the time scales of other types of climate variability are included. A hierarchy of climate models of increasing complexity is reviewed and possible future modelling research on the century time scale is outlined. Author (CISTI)

N92-27511# Mitre Corp., McLean, VA.
ARM REVIEW, 1991
G. MacDonald 20 Jan. 1992 41 p Sponsored by DOE
(AD-A247629; JSR-91-300) Avail: NTIS HC/MF A03

The Department of Energy's Atmospheric Radiation Measurement Program (ARM) is a major component of the U.S. research program in global change. ARM's goals of quantifying the effect of clouds on the earth's radiation budget is a key element in improving global circulation models (GCM) through enhancing understanding of the fast physics of the atmosphere. ARM is a well organized and managed program. A major concern for the programs future is the availability of adequate resources to establish and maintain observation sites in the western tropical Pacific and on the north slope of Alaska. GRA

N92-27571# Argonne National Lab., IL.
EMISSIONS TRADING AND COMPLIANCE: REGULATORY INCENTIVES AND BARRIERS
D. W. South, K. A. Bailey, and K. A. McDermott 1992 26 p Presented at the 1992 Air Emissions and Waste Management Conference, Chicago, IL, 30 Jan. 1992
(Contract W-31-109-eng-38)
(DE92-010280; ANL/CP-75645; CONF-920198-1) Avail: NTIS HC/MF A03

The Title IV of the Clean Air Act Amendments of 1990 authorizes the use of transferable emission allowances to achieve reductions in the power generating industry's SO2 emissions at a minimum possible cost. All electricity generators (greater than 25 MW) are required to hold emissions allowances equal to the amount (tons) of SO2 emitted during a given year, and meet NO(sub x) reduction levels indicated by the Revised New Source Performance Standards (NSPS). This paper will examine the multifaceted goals and problems of states and utilities relative to compliance with Title IV, and in particular as they pertain to the development and functioning of the allowance market together with utility pollution control and power generation technology choice. Section 2 presents possible utility compliance strategies along with possible barriers that utilities may confront regarding the development of a SO2 allowance market. Section 3 discusses current regulatory barriers and requirements being implemented by state public utility commissions, and Section 4 offers some policy recommendations to achieve the goals of Title IV. Finally, Section 5 presents a summary and conclusions; Appendix A provides programs/mandates developed to data by high sulfur coal states in response to Title IV compliance requirements. DOE

N92-27641# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
[ACTIVITIES OF THE CENTRE FOR CLIMATE AND GLOBAL CHANGE RESEARCH] Annual Report No. 1, 1 Jun. 1990 - 31 May 1991
Lawrence A. Mysak Jun. 1991 26 p
(CGCR-91-10; CTN-92-60458) Avail: NTIS HC/MF A03

The Center for Climate and Global Change Research (C2GCR) at McGill University brings together faculty and graduate students from the departments of meteorology, geography, economics and renewable resources to collaborate in various interdisciplinary research activities. Fields in which C2GCR is strong include air-sea interaction and ocean climate studies, especially at high latitudes; cloud-climate interactions; air-land and land-ocean interactions, including hydrological and biogeochemical cycles; and impacts of climate change and climate variability on biological and socio-economic systems. Activities during 1990-91, C2GCR's first year of operation, are summarized. A list of C2GCR reports is included. CISTI

N92-27846# Washington Univ., Seattle. Applied Physics Lab.
ENVIRONMENTAL MEASUREMENTS IN THE BEAUFORT SEA, SPRING 1991 Technical Report, Mar. - Apr. 1991
T. Wen, F. Karig, W. Felton, and P. Keller Jan. 1992 126 p
(Contract N00039-91-C-0072)
(AD-A247928; APL-UW-TR-9204) Avail: NTIS HC/MF A07

Environmental and ambient noise data obtained by the Applied Physics Laboratory of the University of Washington (APL-UW) and the Naval Surface Warfare Center (NSWC) at APLIS 91, an ice camp established in the Beaufort Sea in spring 1991 to support Navy sponsored tests and research during ICEX-91, are presented. The purpose is to provide field data to ice camp participants, so data analysis is limited. The data were collected to document the meteorological and oceanographic conditions that existed during camp activities. The main data sets are weather, floe drift, STD profiles, current, ice properties, and ambient noise. GRA

N92-28056# Argonne National Lab., IL.
GLOBAL CLIMATE CHANGE AND INTERNATIONAL SECURITY
M. Rice 1991 32 p
(Contract W-31-109-eng-38)
(DE92-010868; ANL/RP-75587) Avail: NTIS HC/MF A03

On May 8 to 10, 1991, the Midwest Consortium of International Security Studies (MCISS) and Argonne National Laboratory cosponsored a conference on Global Climate Change and International Security. The aim was to bring together natural and social scientists to examine the economic, sociopolitical, and security implications of the climate changes predicted by the general circulation models developed by natural scientists. Five themes emerged from the papers and discussions: (1) general circulation models and predicted climate change; (2) the effects of climate change on agriculture, especially in the Third World; (3) economic implications of policies to reduce greenhouse gas emissions; (4) the sociopolitical consequences of climate change; and (5) the effect of climate change on global security. DOE

N92-28200# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
AES/NSERC INDUSTRIAL RESEARCH CHAIRS (IRC) IN CLIMATE RESEARCH Progress Report
Lawrence A. Mysak and Charles A. Lin May 1991 25 p
(CGCR-91-9; CTN-92-60530) Avail: NTIS HC/MF A03

The Industrial Research Chairs program in climate research at McGill University focuses on the role of the oceans in climatic variability and climate change. A major accomplishment of the program has been the development of a global upper-ocean circulation model, which is now being coupled to an atmospheric climate model. Other research projects in the dynamics of ocean, climate, and atmosphere are being conducted. Specific subjects of study include the nature and causes of interannual and decadal to century scale climatic fluctuations at high latitudes, global impacts of Arctic climatic variability, thermally forced mesoscale circulations, and tropospheric planetary waves. The program has been successful in training graduate students, postdoctoral fellows, and research associates in modern climate studies and air-sea interaction. A bibliography of publications and presentations by some program personnel is included, along with a financial report. CISTI

N92-28206# Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
CLEAN AIR ACT REQUIREMENTS FOR TRACE METALS INFORMATION
D. Pahl, W. Hunt, and G. Evans Jan. 1992 8 p
(PB92-164995; EPA/600/A-92/069) Avail: NTIS HC/MF A02

The Clean Air Act Amendments of 1990 have expanded the requirements for trace metals and air toxics information in urban areas and added new requirements for this information in rural areas and ecosystems. Specific provisions germane to trace metals and other air toxic compounds are found in Title III, Section 112 and in Title IX, Section 901. In response to these provisions, the United States Environmental Protection Agency (EPA) plans to conduct research in atmospheric monitoring networks in urban areas, in the Great Lakes watershed, and in regional components of a national Clean Air Act status and trends network. Author

N92-28208# Corvallis Environmental Research Lab., OR.
AIR POLLUTION EFFECTS ON BIODIVERSITY

J. R. Barker and D. T. Tingey Apr. 1992 328 p Prepared in cooperation with ManTech Environmental Technology, Inc., Corvallis, OR
(PB92-170166; EPA/600/R-92/056) Avail: NTIS HC/MF A15

To address the issues of air pollution impacts on biodiversity, the U.S. Environmental Protection Agency, Environmental Research Laboratory in Corvallis, OR, the U.S. Fish and Wildlife Service National Fisheries Research Center in Leetown, and the Electric Power Research Institute convened a workshop to evaluate current knowledge, identify information gaps, provide direction to research, and assess policy issues. In order to obtain the most current and authoritative information possible, air pollution and biodiversity experts were invited to participate in a workshop and author papers. The material is organized into four parts: an introduction, an overview of air pollution exposure and effects, the consequences of air pollution on biodiversity, and policy issues and research needs. Author

N92-28222*# National Aeronautics and Space Administration, Washington, DC.
TECHNOLOGY FOR THE MISSION TO PLANET EARTH
Amy Graham, ed. (TRW Space Technology Labs., Redondo Beach, CA.) 1989 53 p Prepared in cooperation with TRW Space Technology Labs., Redondo Beach, CA
(NASA-TM-107952; NAS 1.15:107952; R11-1681) Avail: NTIS HC/MF A04

Mission to Planet Earth is a concept referring to the endeavor of making long term, space based global observations for the purpose of understanding earth system processes. The Ad Hoc Review Team on Space Technology was formed to determine what technologies must be developed in the near term to support this endeavor. The review team's central finding is that the Office of Aeronautics and Space Technology has identified all the correct technologies to pursue, but that the mission and system architecture has not been developed sufficiently to permit determination of meaningful priorities. Some of the specific recommendations of the review team are as follows: (1) long term, space based investigation of global changes and the earth's systems; (2) studies should begin that include the performance of relative cost-benefit trade-off analyses and development of operations concepts; (3) funding should be increased, especially in research and development; (4) pursue new technology in information processing; (5) improve interagency integration and coordination; and (6) after architecture studies are complete, another team should meet to consider questions of technology priorities, development schedules, and funding allocation. H.A.

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N92-27209# Army Engineer Waterways Experiment Station, Vicksburg, MS. Geotechnical Lab.
GEOTECHNICAL CENTRIFUGE USE AT UNIVERSITY OF CAMBRIDGE GEOTECHNICAL CENTRE, AUGUST-SEPTEMBER 1991 Final Report
Paul A. Gilbert Jan. 1992 83 p
(AD-A246490; WES/MP/GL-92-3) Avail: NTIS HC/MF A05

A geotechnical centrifuge applies elevated acceleration to small-scale soil models to simulate body forces and stress levels characteristic of full-size soil structures. Since the constitutive behavior of soil is stress level development, the centrifuge offers considerable advantage in studying soil structures using models. Several experiments were observed and described in relative detail, including experiments in soil dynamics and liquefaction study, an experiment investigation leaning towers on soft foundations, and an experiment investigating migration of hot pollutants through soils. GRA

N92-27347# California Univ., Berkeley. Lawrence Berkeley Lab.
INTERPRETATION OF TIME DOMAIN ELECTROMAGNETIC SOUNDINGS NEAR GEOLOGICAL CONTACTS Ph.D. Thesis
M. J. Wilt Dec. 1991 187 p
(Contract DE-AC03-76SF-00098)
(DE92-010467; LBL-31674) Avail: NTIS HC/MF A09

Lateral changes in geology pose a serious problem in data interpretation for any surface geophysical method. Although many geophysical techniques are designed to probe vertically, the source signal invariably spreads laterally, so any lateral variations in geology will affect the measurements and interpretation. This problem is particularly acute for controlled source electromagnetic soundings because only a few techniques are available to interpret the data if lateral effects are present. In this thesis we examine the effects of geological contacts for the time domain electromagnetic sounding method (TDEM). Using two simple two-dimensional models, the truncated thin-sheet and the quarter-space, we examine the system response for several commonly used TDEM sounding configurations. For each system we determine the sensitivity to the contact, establish how the contact anomaly may be distinguished from other anomalies and, when feasible, develop methods for interpreting the contact geometry and for stripping the contact anomaly from the observed data. Since no numerical models were available when this work was started, data were collected using scale models with a system designed at the University of California at Berkeley. The models were assembled within a table-top modeling tank from sheets or blocks of metal using air or mercury as a host medium. Data were collected with a computer-controlled acquisition system. DOE

N92-27355# McGill Univ., Montreal (Quebec). Climate Research Group.
WAVE-WAVE INTERACTIONS IN A STEADY-STATE STRATOSPHERIC MODEL, PART 1
Charles McLandress and Jacques Derome Mar. 1989 48 p Sponsored by Natural Sciences and Engineering Research Council and Atmospheric Environment Service
(CRG-89-5-Pt-1; CTN-92-60532) Avail: NTIS HC/MF A03

Interactions among stationary planetary waves in a model winter stratosphere are studied both analytically and numerically. A triad of weakly dissipated, weakly interacting waves is examined using a steady-state hemispheric quasi-geostrophic model with a mean zonal wind in solid body rotation. Due to the structure of the model basic state, dissipation is required for the waves to interact. The nonlinear wave structure was found to depend crucially on the number of waves being forced at the lower boundary. By examining the streamfunction response to the leading-order nonlinear forcing terms, the weakly nonlinear wave structure was shown to depend on the vertical structure of the linear waves. It was demonstrated that the position of the response with respect to the forcing was determined to a large extent by the vertical propagation characteristics of the zeroth-order waves. Author (CISTI)

N92-27380# Pennsylvania State Univ., University Park.
WAVE PROPAGATION AT REGIONAL DISTANCES Final Report, 10 Jan. 1989 - 30 Apr. 1991
Charles A. Langston 23 Apr. 1991 156 p
(Contract F19628-89-K-0013)
(AD-A246890; AD-E200854; PL-TR-91-2097) Avail: NTIS HC/MF A08

Wave propagation in Fennoscandia is generally understandable in terms of simple plane layered structure models. Although the data show deviations from such models in terms of effects of layer dip, discrete phases are generated by these crust and mantle structures and are not significantly degraded by heterogeneity. Phase attributes, such as time and phase velocity, can be used to accurately identify arrivals. It was found that S waves are often misidentified at NORESS resulting in poor event locations. The nature of lithospheric heterogeneity which produces P waves' coda may be amenable to analysis since it was found that scatterer

anisotropy appeared to be the strongest effect in controlling coda decay rate in the wave propagation simulations. The NORESS data suggest that scattering in the vicinity of the array is caused by highly anisotropic scatterers (plane-layered-like) with the exception of discrete scattering events caused by P-to-Rg scattering off of topographic features. GRA

N92-27434*# Utah State Univ., Logan.
IONOSPHERIC GRAVITY WAVE MEASUREMENTS WITH THE USU DYNASONDE Final Report, 1 Jan. 1990 - 30 Apr. 1992
Frank T. Berkey and Jun Yuan Deng 1992 111 p Prepared in cooperation with Illinois Univ., Urbana-Champaign
(Grants NAG5-1341; NSF ATM-90-00171)
(NASA-CR-190125; NAS 1.26:190125) Avail: NTIS HC/MF A06

A method for the measurement of ionospheric Gravity Wave (GW) using the USU Dynasonde is outlined. This method consists of a series of individual procedures, which includes functions for data acquisition, adaptive scaling, polarization discrimination, interpolation and extrapolation, digital filtering, windowing, spectrum analysis, GW detection, and graphics display. Concepts of system theory are applied to treat the ionosphere as a system. An adaptive ionogram scaling method was developed for automatically extracting ionogram echo traces from noisy raw sounding data. The method uses the well known Least Mean Square (LMS) algorithm to form a stochastic optimal estimate of the echo trace which is then used to control a moving window. The window tracks the echo trace, simultaneously eliminating the noise and interference. Experimental results show that the proposed method functions as designed. Case studies which extract GW from ionosonde measurements were carried out using the techniques described. Geophysically significant events were detected and the resultant processed results are illustrated graphically. This method was also developed for real time implementation in mind. Author

N92-27594# Lockheed Missiles and Space Co., Palo Alto, CA. Research Lab.
INVESTIGATION OF RING CURRENT/STORM DYNAMICS
H. L. Collin, J. B. Cladis, and J. M. Quinn 31 Aug. 1991 86 p
(Contract F19628-90-C-0119)
(AD-A247554; PL-TR-91-2206; AD-E200902; SR-1) Avail: NTIS HC/MF A05

This study outlines the achievements of the first year of work on data acquired by the Lockheed Ion Mass Spectrometer (IMS-LO), one of the space radiation group of instruments on the Combined Release and Radiation Effects Satellite (CRRES). The purpose of IMS-LO is to study the low energy (110 eV-35 keV) ion component of the ring current plasma. The primary data processing is proceeding rapidly, as is the construction of databases of validated low energy ion data. A number of events have been selected for special study and one of these has been analyzed in detail. A tentative identification has been made of a new mechanism which causes loss of ions. GRA

N92-27620# York Univ. (Ontario).
THE OBSERVABLE EFFECTS OF GRAVITY WAVES ON AIRGLOW EMISSIONS Ph.D. Thesis
David Walter Tarasick Feb. 1989 133 p
(ISBN-0-315-57927-7; CTN-92-60457) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The interaction of gravity waves and airglow emissions is explored with a view to elucidating the observable effects of such waves. The results obtained are applicable to ground-based photometric observations, where the total line-of-sight emission, at an arbitrary viewing angle, is measured. Explicit relations are developed for the dependence of the magnitude and phase of the observable parameter eta, the ratio of brightness fluctuations to temperature fluctuations. Both magnitude and phase depend on dynamical parameters (wavelength and period), the viewing angle at which observations are made, chemical parameters related to the temperature dependence of the reaction chemistry, and the number of bodies involved in the reaction. Methods of distinguishing between evanescent and internal gravity wave modes, and determining the vertical wavelength and direction of propagation for internal modes, are proposed. The specific cases of O2(b(sup 1)sigma) and OH airglow are examined in detail, for different proposed chemical production mechanisms. Attention is given to non steady-state chemistry in the latter case, since the chemical time constants of some implicated species are comparable to gravity wave periods. Author (CISTI)

N92-27642# McGill Univ., Montreal (Quebec). Dept. of Meteorology.
PERSISTENT CIRCULATION ANOMALIES IN OBSERVATIONS AND IN A GENERAL CIRCULATION MODEL Ph.D. Thesis
Bernard Dugas Jul. 1989 218 p
(ISBN-0-315-57198-5; CTN-92-60463) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

A comparative diagnostic study of upper-air persistent atmospheric events, as simulated by a general circulation model (GCM) and as observed, is presented. An overview is provided of the several theories that attempt to explain such phenomena, with particular emphasis on the model of Shutts (1983). It is shown that the spatial distributions of particular events is quantitatively similar in the GCM and observational data. The North Atlantic events are extracted and a rotated empirical orthogonal function (REOF) analysis is done on the resulting data sets. The two REOF sets that are thus obtained are shown to greatly resemble one another. Both explain roughly 50 percent of their original data's variance. The relationships between the modes within a set are presented, so as to understand their probable combined evolution. The results are used to isolate a particular class of events, namely the strong ATL2 dipoles. The time tendencies associated to short time scale synoptic waves are evaluated, using an E-vectors approach, taking care to distinguish between the onset, mature and demise phase of events. It is found that the synoptic waves have a significant impact on the average life cycle of the ATL2 type events. Author (CISTI)

N92-27922# ST Systems Corp., Pacific Grove, CA.
NAVY ATMOSPHERIC BOUNDARY LAYER (NABL) MODEL SYSTEM: SOFTWARE/INTERFACE REQUIREMENTS SPECIFICATION Final Report
Pierre A. Petit Nov. 1991 38 p
(AD-A247501; AD-E040222; NOARL-TN-182) Avail: NTIS HC/MF A03

The engineering and external interface requirements for the Navy Atmospheric Boundary Layer (NABL) Model System are specified. This document will be used as a basis for detailed system design and testing. GRA

N92-27963# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
[ACTIVITIES, ACCOMPLISHMENTS AND RESEARCH PROGRESS OF THE CENTER FOR THEORETICAL GEOPLASMA PHYSICS, CENTER FOR SPACE RESEARCH, MASSACHUSETTS INST. OF TECHNOLOGY] Annual Report No. 2, 15 Jan 1991 - 14 Jan. 1992
Tom Chang 15 Feb. 1992 114 p
(Grant AF-AFOSR-0085-90)
(AD-A248572; AFOSR-92-0230TR) Avail: NTIS HC/MF A06

This annual report contains a detailed description of the activities, accomplishments, and research progress of the MIT Center for Theoretical Geoplasma Physics established under the University Research Initiative Program by AFOSR. During this second phase of the program, the Center has made definite strides toward the goals prescribed in the renewal proposal. The Center now has a staff of twenty-five (25) faculty, research scientists, postdoctoral, graduate and undergraduate students and visiting scientists. Members of the Center published forty-eight (48) scientific papers and five (5) books and proceedings, delivered forty (40) invited lectures and fifty-one (51) contributed papers. We have initiated a number of new research activities to

complement our other ongoing research programs. Some of our research efforts have already been utilized by Dr. J. R. Jasperse's group at the Geophysics Directorate of the Phillips Laboratory in practical space technology applications relevant to the missions of the Air Force. In addition to the Phillips Laboratory, the Center has interacted with numerous research organizations and universities. The research publications are generally the direct product of such interactions. GRA

N92-28072# Texas Univ., El Paso.
DETERMINATION OF SHEAR WAVE VELOCITY STRUCTURE IN THE RIO GRANDE RIFT THROUGH RECEIVER FUNCTION AND SURFACE WAVE ANALYSIS, APPENDIX B M.S. Thesis
Brian P. Murphy Aug. 1991 128 p Sponsored by AFGL
(AD-A246937) Avail: NTIS HC/MF A07

Waveform modeling of radial component receiver functions from ANMO (Albuquerque, New Mexico Observatory) for three source back azimuths (northwest, southeast, and southwest) was performed. The receiver functions were derived through source equalization deconvolution of merged long period and short period digital three component seismograms. Derived S-wave velocity models reflect dominantly intermediate composition granitic rock in the upper crust (above 15 km depth, Vs 3.5 km/sec) and middle crust (15-25 km depth, Vs 3.5-3.7 km/sec). Lower crustal shear velocities of approximately 3.75-3.85 km/sec may be representative of intermediate-to-mafic granulite facies, possibly together with previously underplated mafic material and other precursor crustal rocks. Shear wave attenuation between about 30-34 km may indicate a lower crustal partial melt zone. A 3-to-6 km thick interval is interpreted as a partial melt zone in the upper mantle leading into less depleted spinel peridotite (Vs = 4.25-4.35 km/sec) near 37 km. Inversion of EPT-ALQ interstation dispersion data for average S-wave velocity structure produces a satisfactory velocity tie to the middle and lower crust portions of the southwest back azimuth model. GRA

N92-28201# McGill Univ., Montreal (Quebec). Climate Research Group.
WAVE-WAVE INTERACTIONS IN A STEADY-STATE STRATOSPHERIC MODEL, PART 2
Charles McLandress and Jacques Derome Mar. 1989 64 p Sponsored by Atmospheric Environment Service and Natural Sciences and Engineering Research Council
(CRG-89-6-Pt-2; CTN-92-60531) Avail: NTIS HC/MF A04

The structure of stationary planetary waves in the winter stratosphere is computed by means of a steady-state hemispheric quasi-geostrophic model with a zonal basic state and lower boundary forcing obtained from climatology. The nonlinear wave solution is found to resemble rather closely the linear one, despite the large wave amplitudes which distort considerably the westerly zonal flow. Zonal wavenumber one is the most affected by the wave-wave interactions, experiencing an increase in amplitude and a decrease in westward phase tilt in the northerly regions of the middle stratosphere. Comparison of the solutions to the corresponding climatological wave structure indicates that the inclusion of the nonlinear terms leads to an improvement of the structure of wavenumber one. An examination of the 5-year January climatological basic state reveals a distinct linear relationship between the zonal streamfunction and the zonal potential vorticity in middle and northerly latitudes. Consequently, the wave-wave interactions are to a first approximation a result of the presence of the model dissipation. Weak dissipation in this region implies only weak interactions, which explains the quasi-linear structure of the solutions. Author (CISTI)

N92-27265*# POD Associates, Inc., Albuquerque, NM.
MODELLING THE NEAR-EARTH SPACE ENVIRONMENT USING LDEF DATA Abstract Only
Dale R. Atkinson, Cassandra R. Coombs, Lawrence B. Crowell, and Alan J. Watts *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 54
(For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N92-27336# Pennsylvania State Univ., University Park. Dept. of Meteorology.
MODELING AND OBSERVATIONAL STUDIES OF MESOSCALE AIR-MASS BOUNDARIES AND WARM-SEASON CONVECTIVE PRECIPITATION Final Report, 1 Dec. 1987 - 31 May 1991
Thomas T. Warner, J. M. Fritsch, and Toby N. Carlson 31 May 1991 14 p
(Grant AF-AFOSR-0050-88)
(AD-A247030; AFOSR-92-0082TR) Avail: NTIS HC/MF A03

Diagnostic and modeling studies have been performed to improve our understanding of, and skill at forecasting, mesoscale weather systems and circulations. In particular, we have investigated: The effects of entrainment and detrainment on convective cloud heating and moistening profiles; The effects of mesoscale water bodies and ocean currents on the large scale environment and transient weather systems; The effect of subcloud-layer evaporative cooling and changes in radiatively produced surface fluxes on low-level circulations; How soil moisture can be modeled; The synoptic climatology of the elevated mixed layer and lid in the southwestern U.S.; The life cycle of the lid in the southwestern U.S.; and the skill associated with cloud forecasts from the Penn State/NCAR mesoscale model. GRA

N92-27420# Bonn Univ. (Germany, F.R.). Inst. fuer Physik.
IMPLEMENTATIONS AND ANALYSIS OF FOIL CHAFF CLOUD MEASUREMENTS FOR THE WIND FIELD IN WINTER OVER NORTHERN NORWAY, AT 75 UP TO 100 KILOMETERS HEIGHT Thesis [DURCHFUEHRUNG UND ANALYSE VON FOLIENWOLKENMESSUNGEN DES WINDFELDES IM WINTER UEBER NORDNORWEGEN IN 75 BIS 100 KM HOEHE]
Andreas Bacher Apr. 1991 212 p In GERMAN; ENGLISH summary
(Bonn-IR-91-15; ISSN-0172-8741; ETN-92-90833) Avail: NTIS HC/MF A10

Vertical profiles of the horizontal wind are deduced from data obtained in 22 experiments, and in a number of independent measurements, after analyzing possible systematic experimental errors/resolution limits, e.g., cloud extent, low fall speed. Wind variation by height was seen to be mostly dominated by internal gravity waves. Induced wind shear was examined in connection with static stability, loading to vertical profiles of the Richardson number. The new set of data reduction software developed allows quick, standardized and accurate wind determination. ESA

N92-27425# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
CLIMATIC ATLAS OF THE NORTHERN HEMISPHERE SEASONAL AND ANNUAL MEAN SEA-LEVEL PRESSURES, 1952-1987
S. B. Power, Lawrence A. Mysak, W. L. Chapman, and J. E. Walsh (Illinois Univ., Urbana.) Dec. 1990 196 p Sponsored in part by Natural Sciences and and Engineering Research Council; Atmospheric Environment Service; FCAR; and ONR
(CGCR-90-17; CTN-92-60526) Avail: NTIS HC/MF A09

An atlas is presented consisting of contour plots of the seasonal, annual, and climatological atmospheric mean sea level pressures for the period 1952 to 1987 for latitudes of 20 deg north and higher. The atlas has been compiled primarily as an aid to researchers in climatic studies centered on the Arctic. The data used was archived at the National Center for Atmospheric Research. The sources of the analyses for the period examined are the US Navy and the National Meteorological Center. No data were missing after 1971, and very little were missing from the 1960s. Data missing during the 1950s were largely confined to North Africa and Tibet. Isolated missing data were linearly interpolated along lines of latitude. The monthly data maps are grouped into four seasons, and data are contoured using a stereographic projection centered on the North Pole. A contour interval of 1 millibar is chosen for all plots. Sample pages of the

data and the programs used in data plotting are appended.
CISTI

N92-27427# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
CLIMATIC ATLAS OF SEASONAL AND ANNUAL ARCTIC SEA-LEVEL PRESSURES, SLP ANOMALIES, AND SEA-ICE CONCENTRATIONS, 1953-1988
Lawrence A. Mysak and Jia Wang Sep. 1991 197 p Sponsored by Natural Sciences and Engineering Research Council; Atmospheric Environment Service; FONDS; FCAR; and ONR Sea ice concentration maps as supplement
(CGCR-91-14; CTN-92-60528) Avail: NTIS HC/MF A09

Seasonal and annual maps are presented of sea level pressure (SLP), SLP anomalies, and sea ice concentration (SIC) in the Arctic Ocean and neighboring seas for the years 1953-1988. The data are conventionally divided into four seasons each year, and SLP, SLP anomaly, and SIC data maps are shown together for the same year. Contour intervals are 2 millibars in SLP maps and 1 millibar in SLP anomaly maps. SIC maps are shaded to represent percentages of ice cover expressed in tenths. An overlay is provided to enable sea-ice anomalies for any given season to be seen. CISTI

N92-27551# Air Weather Service, Scott AFB, IL.
DUST AND SAND FORECASTING IN IRAQ AND ADJOINING COUNTRIES
Walter D. Wilderson Nov. 1991 76 p
(AD-A247588; AWS/TN-91/001) Avail: NTIS HC/MF A05

This report, based partly on the author's recent personal experience in desert weather forecasting, discusses airborne dust and sand in Iraq, Kuwait, Syria, eastern Jordan, western Iran, and the northern Arabian Peninsula. It describes geography of the region and discusses general types of duststorms and sandstorms, locates and describes sources of sand and dust in Mesopotamia, Southwest Asia, and the Red Sea area, provides practical tips and rules of thumb for forecasting airborne sand and dust and describes methods for enhancing the appearance of airborne dust in satellite imagery and provides example satellite imagery that shows airborne dust produced under several conditions. GRA

N92-27610# Toronto Univ. (Ontario). Dept. of Physics.
MOMENTUM TRANSPORT BY CUMULUS CLOUDS AND ITS PARAMETERIZATION Ph.D. Thesis
Guang Jun Zhang 12 Jun. 1989 187 p
(ISBN-0-315-54644-1; CTN-92-60459) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The effect of cumulus convection on the large-scale motion field is examined. A parameterization scheme is developed to calculate the vertical transport of momentum by cumulus clouds. The effect of the perturbation pressure field induced by cumulus convection on the cloud momentum and its vertical transport is taken into account for the first time. It is shown that a perturbation pressure field is required to balance the irrotational component of the local Coriolis force produced by the interaction of the large-scale flow field with the cumulus scale circulation. To facilitate quantitative evaluation of the horizontal pressure gradient force across the cloud, a simple cloud model which specifies the dynamic and the thermodynamic structures in cloud is developed. The parameterization scheme is applied to several convective events in the tropics and the midlatitudes. It is shown that the cloud mean wind obtained from the parameterization scheme changes significantly with height if the environmental wind has a strong vertical shear. The perturbation pressure gradient force across the cloud plays an important role in changing the cloud mean momentum. The vertical transport of the horizontal momentum by cumulus clouds is parameterized and compared to observations and numerical simulations, and good agreement is found in both cases. Author (CISTI)

N92-27622# British Columbia Univ., Vancouver.
COASTALLY TRAPPED DISTURBANCES IN THE LOWER ATMOSPHERE Ph.D. Thesis
Christopher James Ch Reason Aug. 1989 240 p
(ISBN-0-315-55186-0; CTN-92-60462) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Coastally trapped disturbances that propagate in the marine layers of western North America, Southern Africa and southeastern Australia are examined. These areas of the world are considered most favorable for the propagation of the disturbances because they all possess pronounced subsidence inversions and barriers like coastal mountain ranges. Trapping of the disturbance energy within a coastal zone then occurs through this inversion being situated below the mountain crests and through Coriolis effects on the propagating disturbances themselves. As the propagation occurs, marked changes in the inversion height and local weather conditions below the inversion are observed. It is argued that the fundamental dynamics of these disturbances are identical (hydrostatic and semigeostrophic) in each area but that regional differences in the forcing and boundary conditions are responsible for the various manifestations of the disturbances. Based on the observed commonality between the three cases, a theory of coastally trapped disturbances is developed from the shallow water equations for a rotating, stratified and flat-bottomed fluid. It is shown that the theory will admit two types of solution, a Kelvin wave and a coastal gravity current, which if higher order effects are included, are found to be related. Author (CISTI)

N92-27655# Naval Postgraduate School, Monterey, CA.
AMBIENT SOUND IN THE OCEAN INDUCED BY HEAVY PRECIPITATION AND THE SUBSEQUENT PREDICTABILITY OF RAINFALL RATE M.S. Thesis
Charles C. McGlothin, Jr. Jun. 1991 78 p
(AD-A246010) Avail: NTIS HC/MF A05

An experiment was performed in the Gulf of Mexico to characterize the underwater sound generated by the heavy precipitation and to determine if rainfall rate can be measured using underwater sound. During this stage of the experiment, twenty-two data sets were recorded with rainfall rates up to 340 mm/hr. For a given rainfall rate, it is found that sound levels from heavy convective precipitation are higher at the beginning of the storm and when rainfall rate is increasing than at the end of the storm event or when rainfall rates are decreasing. This may be due to changes in the drop size distribution during the life cycle of the storm or to variations in the temperature difference between the raindrop and the ocean surfaces. Very heavy rainfall generates near surface bubble layers or bubble clouds which attenuate sound energy at higher frequencies. The distinctive 15 kHz peak in the sound spectrum for light rain is absent during heavy rain suggesting that the sound production mechanism previously identified for small drops is suppressed by heavy rain even though those small drops are undoubtedly present during heavy rainfall rates. These data show a very high correlation between underwater sound level and the logarithm of the rainfall rate except when high wind speeds and high rainfall rates are present. An empirical rainfall rate algorithm for convective precipitation is proposed suggesting that sound energy is directly proportional to rainfall rate. GRA

N92-27668# Nevada Univ., Las Vegas. Desert Research Inst.
CCN SPECTRA MEASUREMENTS AS AN ACTIVE TRACER OF STRATOCUMULUS MECHANISMS Annual Report, Nov. 1990 - Oct. 1991
James G. Hudson Jan. 1992 10 p
(AD-A246499) Avail: NTIS HC/MF A02

This manuscript compares and contrasts the measurements about the marine stratus clouds of FIRE with the measurements near the cumulus clouds in HaRP. The Cloud Condensation Nuclei (CCN) measurements in First ISCCP Regional Experiment (FIRE) were recently published. An example of the vertical distribution of CCN is given. In both regimes the concentration of CCN was higher above the cloud layers, that is above the marine inversion.

In Hawaii there was usually not the layer of high concentrations just above the clouds (just above the inversion) as was seen in FIRE. Measurements of lower concentrations within the boundary layer are consistent in both projects and appear to be due to coalescence scavenging which was in fact much more rapid in Hawaii due to the larger cloud droplets and a more active collision-coalescence process which resulted in substantial atmospheric precipitation. Extremely low particle concentrations were found very close to some of the clouds. This was often the case just above the cloud tops where concentrations of less than 5 cm(exp 3) were often observed. High concentrations of CCN were also found within the clouds. GRA

N92-27696# Utah State Univ., Logan. Center for Atmospheric and Space Sciences.
MEASUREMENTS OF MESOSPHERIC WINDS AND WAVES Final Report, Dec. 1988 - Jan. 1992
Gene W. Adams, John W. Brosnahan, and Robert G. Roper 21 Jan. 1992 105 p
(Contract F49620-89-C-0022)
(AD-A247181; CASS-GR-013; AFOSR-92-0019TR) Avail: NTIS HC/MF A06

An imaging Doppler interferometer (IDI) radar was operated to analyze the characteristics of radar scattering in terms of a number of discrete scattering points, also referred to as multiple scattering centers, IDI/MSC for short. For each of these points the three-dimensional location, radial velocity, and amplitude and phase are determined, similar to the output of meteor radars. The conventional Groves' meteor wind radar analysis was applied to the scattering points to produce the mean apparent motions over the height range from 70 to 110 km. The mean apparent motion of the scattering centers is the quantity that would correspond to the neutral atmosphere wind or bulk motion if the scattering points are physical entities (such as turbulent eddies) whose motions are determined solely by advection. This is the quantity which is treated as the 'wind' in the analysis and which should be compared to the wind measurements as deduced from the other methods employed during this campaign. Extreme care must be used in interpreting the velocities measured by partial reflection radars as winds. GRA

N92-27787# Naval Postgraduate School, Monterey, CA.
INTEGRATED MICROWAVE AND INFRARED PRECIPITATION ANALYSIS M.S. Thesis
Lisa E. Frailey Sep. 1991 87 p
(AD-A246070) Avail: NTIS HC/MF A05

GOES infrared (IR) data is intercompared with rain analyses from the SSM/I exponential rain algorithm for the purpose of determining thresholds and statistics from infrared (IR) imagery which delineate oceanic rain area. Data from ERICA cyclogenesis cases were evaluated. Discriminant analysis was performed using IR mean cloud top temperature, standard deviation and kurtosis as discriminating variables. Resulting functions separated rain from no-rain areas with average Probability of Detection (POD) and Percentage Error (ERR) scores of 0.68 and 0.30 for development data (0.62 and 0.37 for validation data). The scheme demonstrated little skill in discriminating rain categories beyond rain/no-rain. An IR threshold scheme was used to delineate rain/no-rain areas by optimizing a set of evaluation statistics. Optimal thresholds attained a predetermined POD level of 0.60 while minimizing percent misclassification error and SSM/I-IR rain area difference. The scheme yielded average POD and ERR scores of 0.64 and 0.38 with IR thresholds from 229 to 232 K. Results for both the discriminant analysis and optimal threshold schemes compare favorably with previous studies. The use of the SSM/I rain analyses with geostationary imagery allows reliable, frequent, large scale analysis of oceanic precipitation. Author (GRA)

N92-27842# Naval Oceanographic and Atmospheric Research Lab., Monterey, CA.
THE NOGAPS FORECAST MODEL: A TECHNICAL DESCRIPTION Final Report
Timothy F. Hogan, Thomas E. Rosmond, and Ronald Gelaro Dec. 1991 223 p
(AD-A247216; NOARL-13) Avail: NTIS HC/MF A10

The Navy Operational Global Atmospheric Prediction System (NOGAPS) provides numerical guidance and products in support of a wide range of Navy oceanographic and atmospheric requirements. The forecast model component of NOGAPS is the heart of the system and represents a multiyear development effort by the scientists of the Naval Oceanographic and Atmospheric Research Laboratory's Atmospheric Directorate. Because many other Navy oceanographic and atmospheric research efforts depend on NOGAPS for environmental inputs, there is continuing demand for detailed technical descriptions of the forecast model's physical, mathematical, and computational processes. Only with this documentation can other Navy scientists understand research results influenced by NOGAPS output products. Because such numerical weather prediction systems as NOGAPS are constantly evolving, periodic updates to system documentation are also a key to supporting future Navy environmental research. GRA

N92-27845# Phillips Lab., Hanscom AFB, MA.
SMALL BALLOON BALLISTIC TRACING AND BEHAVIOR ANOMALIES
John R. Ground 29 Jan. 1992 9 p Previously announced in IAA as A92-11026
(AF Proj. 7659)
(AD-A247435; AD-E200886; PL-TR-92-2021) Avail: NTIS HC/MF A02

A balloon tracking and meteorological data gathering system was developed for small free floating balloons. The evolution and test of this system and several small balloon flights are described. Balloons of different volumes were flown at several altitudes, varying durations, and times of day. Position, pressure-altitude, and temperature data from these flights were closely monitored. These data have been correlated with cloud cover, terrain, and diurnal changes. Data from the July 1990 flight series are described in the greatest detail. GRA

N92-27859# Range Commanders Council, White Sands Missile Range, NM. Meteorology Group.
METEOROLOGICAL MEASUREMENT GUIDE
Jan. 1992 90 p
(AD-A247455; RCC/MG-381-92) Avail: NTIS HC/MF A05

Provides guidance to users of meteorological instrumentation who are tasked with producing reliable measurements; that is, instruments functioning with required precision and accuracy, and measurements representative of the phenomenon to be measured. It is designed to serve as a general guide to the use of meteorological instruments. GRA

N92-27912# Naval Postgraduate School, Monterey, CA.
THE EFFECT OF LATENT HEAT RELEASE ON THE ERICA IOP-5 CYCLONE M.S. Thesis
Frank W. Baker Sep. 1991 86 p
(AD-A245779) Avail: NTIS HC/MF A05

The effect of latent heat release on the development of a rapidly deepening extratropical cyclone that occurred during Intensive Observation Period (IOP) 5 (18-20 Jan. 1989) of the Experiment on Rapidly Deepening Cyclones over the Atlantic (ERICA) is examined using a diagnostic height tendency equation. Data consist of Nested Grid Model (NGM) forecasts executed with and without latent heating feedback. Withholding latent heat release significantly decreased the intensity of not only the surface cyclone, but its associated 500 mb trough/ridge system as well. Propagation speed differed only slightly between the two forecasts, allowing the differences in intensification to be explored through height tendency differences between the two forecasts. Model results show that at 500 mb, latent heat release affects the height tendencies primarily through indirect means, chiefly by enhancing vorticity advection. Differential thermal advection and vertical advection of static stability tended to offset each other, as did vertical advection of vorticity and tilting effects. A height anomaly

due to latent heat release was located downstream of the 500 mb trough and served as a focus for forcing differences associated with latent heating. GRA

N92-27988# Florida Univ., Gainesville. Dept. of Electrical Engineering.
LOCATION AND CHARACTERIZATION OF IN-CLOUD LIGHTNING CURRENTS BY MULTIPLE STATION VHF AND ELECTRIC FIELD MEASUREMENTS Annual Technical Report, 15 Nov. 1990 - 14 Oct. 1991
Ewen M. Thomson 14 Dec. 1991 6 p
(Grant AF-AFOSR-0093-91)
(AD-A247051; AFOSR-92-0125TR) Avail: NTIS HC/MF A02

A network has been established that measures and records electric fields in a 600 Hz to 3.5 MHz 3dB bandwidth at five stations at Kennedy Space Center. Signals were recorded at the central station with a 20 MS/s digitizing system operating on a 24 hour per day basis. Data has been obtained from both lightning and small discharges that do not fit the commonly accepted definition of lightning . These small discharges frequently precede the first cloud-to-ground flash in a storm and are the most significant finding in the research so far. They have considerable importance in the field of thunderstorm electrification in that they predominantly occur below the freezing level, at a mean height of about 3-4 km. GRA

N92-28039# Naval Postgraduate School, Monterey, CA.
A PROTOTYPE CLIMATE INFORMATION SYSTEM M.S. Thesis
Terry K. Jarrett Jun. 1991 83 p
(AD-A245352) Avail: NTIS HC/MF A05

A prototype Climate Information System (CIS) is developed to manage and display climatic data as part of the Navy's Tactical Environmental Support System (TESS). The CIS reduces the time and effort required to locate, ingest and analyze climatic data. The CIS remedies accessibility problems of existing climatologies by using a Data Base Management System (DBMS) to manage on-line data sets. The CIS computer graphics improve data comprehensibility by remapping data to common projections. The CIS design rationale and implementation methodology are documented. The climatic data requirements for TESS are defined. The CIS capabilities are demonstrated with sample data sets which meet some of these requirements. The CIS design allows additional data sets to be added as needed. GRA

N92-28168# Naval Oceanographic and Atmospheric Research Lab., Monterey, CA.
AN EVALUATION OF THE NAVY ATMOSPHERIC BOUNDARY LAYER MODEL Final Report
G. N. Vogel and R. H. Langland Aug. 1991 32 p
(AD-A247134; AD-E040221; NOARL-TN-160) Avail: NTIS HC/MF A03

The results from a test performed to validate the Navy Atmospheric Boundary Layer (NABL) model are presented. Average statistics indicate that NABL forecast temperature profiles compare favorably with those from a 40 km horizontal resolution version of the Navy Operational Regional Atmospheric Prediction System (NORAPS), but that negative (dry) moisture biases are more severe in the NABL model. Test results indicate that the NABL model is superior to NORAPS for short-range forecasting of elevated trapping layers; however, NABL's ability in surface ducting assessment was found to be limited. It is recommended that the NABL model be upgraded to operational status so that its use in refractivity forecasting and in applications programs which profile high resolution boundary layer information may be exploited. GRA

48 OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources.

For related information see also *43 Earth Resources and Remote Sensing.*

N92-27199# Oregon State Univ., Corvallis. Coll. of Oceanography.
INVESTIGATIONS OF THE SEAFLOOR COUPLING CHARACTERISTICS OF THE NEW ONR OBS AND RELATED QUESTIONS Final Technical Report
Anne Trehu 10 Feb. 1992 31 p
(Contract N00014-89-J-1635)
(AD-A246241) Avail: NTIS HC/MF A03

A series of transient tests were conducted to determine the seafloor coupling characteristics of the new ONR Ocean Bottom Seismology. Seismic energy radiated from the main recording package as a result of motion of the recording package was also measured. The vertical coupling resonances of both the recording package and the sensor package are somewhat lower than those predicted by a simple model of soil-structure interaction, but are generally in agreement with the theory. The most important result of this study is that significant energy is radiated from the recording package in response to horizontal motions of the recording package. When the sensor package is 1 m from the recording package, the amplitude of the recorded signal is similar to that recorded on the recording package. In the field, this effect will result in increased noise recorded by the sensors if the recording package is disturbed by seafloor currents or biological activity. The amplitude of this signal attenuates rapidly with distance, suggesting that an improved response can be achieved by increasing the separation between the recording package and the sensors. This effect is much less severe for vertical disturbances of the recording package. GRA

N92-27340# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
CURRENT AND FUTURE TRENDS IN ARCTIC CLIMATE RESEARCH: CAN CHANGES OF THE ARCTIC SEA ICE BE USED AS AN EARLY INDICATOR OF GLOBAL WARMING?
Lawrence A. Mysak Jan. 1991 35 p Presented at the Role of Sea Ice in Climate Change Studies Workshop, Montreal, Quebec, 29-30 Nov. 1990 Sponsored by Natural Sciences and Engineering Research Council; Atmospheric Environment Service; and ONR
(CGCR-91-1; CTN-92-60523) Avail: NTIS HC/MF A03

The response of recently developed coupled atmosphere-ocean general circulation models to an increase of atmospheric CO2 concentration is reviewed, with special emphasis given to the Arctic region. Because these models neglect many important air-ice-ocean interactions and therefore cannot simulate the full range of high-latitude climatic variability, the changes predicted for the Arctic (much higher surface air temperatures and hence considerably less sea ice coverage) under a CO2-enriched atmosphere are open to question. Consistent with this assessment is the fact that recent high-resolution Arctic sea ice cover data do not show evidence of a global warming signal that rises above the background noise of interannual climatic variability. Also, to assess whether future changes in the Arctic ice pack are due at least in part to CO2-induced climatic change, a better understanding of the nature and causes of interannual and interdecadal climate fluctuations in the Arctic are required. From an analysis of nearly 90 years of sea ice extents, as well as oceanic, atmospheric, and hydrological data, it appears that Arctic climate cycles with roughly a 20-year period are common. Clearly, such natural interdecadal variability needs to be taken into account when looking for signs of CO2-induced climate change during the next century. Author (CISTI)

N92-27341# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
SEASONAL, MONTHLY, AND ANNUAL REPORTS OF OCEAN WEATHER STATIONS: ANOMALY TIME SERIES OF SURFACE HEAT BUDGET PARAMETERS

Rejean Michaud and Charles A. Lin Feb. 1991 139 p Sponsored by Natural Sciences and Engineering Research Council and Atmospheric Environment Service
(CGCR-91-3; CTN-92-60524) Avail: NTIS HC/MF A07

The seasonal, monthly, and annual mean anomaly time series of heat exchange parameters of the Ocean Weather Station (OWS) observations in the North Atlantic and North Pacific are presented. These time series are based on monthly summaries for the period of 1946-1974. The anomalies of the recorded measurements are examined as well as the inferred air-sea heat exchange anomalies. The method used in computing the ocean surface heat budget is included. Except for the sea surface temperature, air temperature and sea level pressure, the OWS marine reports appear to be the only observations of the world oceans sufficiently accurate to correctly capture long-period trends or interannual variabilities.
Author (CISTI)

N92-27342# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
CLIMATIC ATLAS OF SEASONAL SEA-LEVEL PRESSURE AND SEA-ICE CONCENTRATION IN THE HUDSON BAY-BAFFIN BAY-LABRADOR SEA REGION, 1953-1988
Jia Wang and Lawrence A. Mysak Mar. 1991 105 p Sponsored by Natural Sciences and Engineering Research Council; Atmospheric Environment Service; FCAR; ONR
(CGCR-91-5; CTN-92-60535) Avail: NTIS HC/MF A06

The seasonal and interannual variabilities of the sea level pressure (SLP) and sea ice concentration (SIC) in the Hudson Bay region are presented, including neighboring basins and seas, for the years 1953 to 1988. The SLP data originate from the National Center for Atmospheric Research and the SIC data originate from the US Navy and various national meteorological agencies. The data are conventionally divided into four seasons and presented in map form, showing SLP and SIC together for the same year. SLP maps are drawn in contours of 2 millibars, with indication of local lows and highs. SIC maps are shaded according to the degree of ice cover, expressed in tenths. CISTI

N92-27356# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
INTERANNUAL VARIABILITY OF SEA-LEVEL PRESSURE, SEA-ICE, AND RUNOFF OVER THE ARCTIC
Scott B. Power and Lawrence A. Mysak Apr. 1991 76 p Submitted for publication Sponsored by Natural Sciences and Engineering Research Council; Atmospheric Environment Service; FCAR; and ONR
(CGCR-91-6; CTN-92-60533) Avail: NTIS HC/MF A05

Fluctuations in the monthly mean sea-level pressure (SLP) field over the Arctic on interannual time scales are characterized and their statistical association with fluctuations further south are determined. The eastern Arctic is most closely associated with the North Atlantic, while the importance of the North Pacific becomes increasingly important at all Arctic sites at lower frequencies. The dynamical coupling between the Arctic and the two oceans is fundamentally different, resulting in two distinct sources of interannual variability. The first source is most closely associated with the North Atlantic Oscillation but can be modified by variability over the North Pacific. Associations between the SLP field and atmospheric indices of importance in modifying sea-ice motion are determined. For example, the magnitude of the wind-stress curl over the Beaufort Sea is increased if the Aleutian Low is intensified. Storm activity off Newfoundland and farther east is subdued once the cool water associated with heavy ice conditions has been advected into the region by the prevailing ocean surface currents about three years later. Increased runoff over northern Canada is accompanied and preceded by an Aleutian Low which is intensified in its eastern sector and a weakened circulation over the entire North Atlantic, including its Arctic extension. Author (CISTI)

N92-27357# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
REVIEW OF THE PHYSICAL OCEANOGRAPHY OF THE LABRADOR SEA
Thierry Reynaud Aug. 1990 26 p
(CGCR-90-12; CTN-92-60534) Avail: NTIS HC/MF A03

The currents and water masses found in the Labrador Sea are described. It is shown that both the deep and surface circulations in this sea are cyclonic and that there are five components: Northwest Atlantic bottom water, North Atlantic deep water, Labrador Sea water, the West Greenland Current, and the Labrador Current. Typical temperature and salinity profiles are illustrated and volume transports are estimated. The forcing mechanisms operative on the Labrador Sea are then reviewed: winds, atmospheric pressure, heat exchange, evaporation, and precipitation. It is shown that the Labrador Sea dynamics is strongly dominated by air-sea-ice interactions. Finally, some numerical models of the Labrador Sea circulation are evaluated. The importance of the joint effect of baroclinicity and relief is stressed. A review of some previous model results is presented, ending with a dynamical technique used successfully to describe the general circulation in the Atlantic. The main steps, advantages, and disadvantages of this dynamical techique are outlined.
CISTI

N92-27370# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
SENSITIVITY STUDY OF A DYNAMIC THERMODYNAMIC SEA-ICE MODEL
David M. Holland, Lawrence A. Mysak, and Josef M. Oberhuber Dec. 1991 448 p Sponsored by Atmospheric Environment Service; Natural Sciences and Engineering Research Council; ONR; Commission of the European Communities; and BMFT
(CGCR-91-22; CTN-92-60525) Avail: NTIS HC/MF A19

A sensitivity study of the simulation of the seasonal ice cover in the Arctic Ocean and the Greenland, Iceland and Norwegian seas is presented. The sea ice model used is that of Holland et al (1991). The sensitivity studies are carried out under three different themes: numerical conditions, parameter values, and physical processes. The last theme refers to experiments in which physical processes are either newly added or completely removed from the model. About 80 sensitivity studies have been performed in which a change from a control run environment has been implemented. Comparisons are made between the control run and each sensitivity run, based on time series of the seasonal cycle of the domain averaged ice thickness, compactness, areal coverage, and kinetic energy. In addition, seasonally and spatially varying fields of ice thickness, compactness, velocity, and surface temperature are presented for each experiment. A brief description and discussion of each sensitivity experiment is presented. The simulation of the seasonal cycle of Arctic sea ice cover is shown to be robust. Author (CISTI)

N92-27502# Naval Postgraduate School, Monterey, CA.
MAGNETIC FIELDS GENERATED BY INTERNAL OCEAN SEAWATER MOTION M.S. Thesis
Charles A. Davis Dec. 1991 80 p
(AD-A246589) Avail: NTIS HC/MF A05

This thesis models induced magnetic fields, caused by the motion of seawater in the Earth's magnetic field, analytically and compares the results to arctic on-the-ice magnetic fluctuation measurements. The oceans have various types of internal motions, such as internal waves and turbulence. This motion of sea water, which is a conductor, in the earth's magnetic field induces a current density. The current density, in turn, induces its own magnetic field. This thesis models internal waves and upper layer ocean turbulence analytically. The corresponding induced magnetic fields are calculated using a static form of Maxwell's equations and parameters for the Arctic are inserted. Comparisons are made with measurements from the Arctic Internal Wave Experiment. The predicted fields from internal waves have magnitudes that are measureable and of the same order of magnitude as ionospherically generated fields. The predicted fields from turbulence are several

orders of magnitude smaller than ionospherically generated fields. Besides giving information about internal motions in the ocean, the seawater induced fields are a noise source in magnetic anomaly detection. GRA

N92-27507# Naval Postgraduate School, Monterey, CA.
CLOUD EFFECTS ON OCEAN MIXED LAYER IN THE NORTHEAST PACIFIC OCEAN M.S. Thesis
Pao-Kun Wu Jun. 1991 79 p
(AD-A246920) Avail: NTIS HC/MF A05

This study was conducted to examine the effects of clouds on the ocean mixed layer, both short-term and seasonal. It utilized data collected at Ocean Station Papa in the northeast Pacific. Two numerical modeling simulations were performed (i.e., with variable cloud and with variable precipitation). The results for the variable cloud simulation indicated that the downward surface buoyancy flux and longer daylight period in summer may induce a significant albedo effect of cloud on ocean mixed layer. The upward surface buoyancy flux and longer night period in winter will result in a pronounced greenhouse effect of cloud on ocean mixed layer. The results of variable precipitation simulation showed that the mixed layer is most sensitive to precipitation between October and March. Model predictions are verified using data at Ocean Station Papa for monthly and yearly mean values of cloud cover and precipitation. The comparison between model prediction and observations shows that the mean values of observed MLD (H = 60.9 m) are much deeper than model-predicted values (H = 36.5 m). GRA

N92-27515# Woods Hole Oceanographic Inst., MA.
HYDROGRAPHIC DATA FROM THE 10 DEG N TRANS-PACIFIC CRUISE R/V MOANA WAVE CRUISE NO. 89-03, -4, -6
Sep. 1991 314 p
(Grants NSF OCE-87-16910; NSF OCE-88-12576)
(PB92-170224; WHOI-91-32) Avail: NTIS HC/MF A14

A trans-Pacific hydrographic section along approximate latitude 10 deg N was occupied in Feb. - May 1989 from the R/V Moana Wave. A description of the instrumentation employed and data reduction techniques is given. Listings of the observations and plates of contoured sections of the water property distributions are presented, along with statements of data accuracies and uncertainties. GRA

N92-27533# Naval Postgraduate School, Monterey, CA.
ACOUSTIC TOMOGRAPHY IN THE GREENLAND SEA M.S. Thesis
John E. Joseph Jun. 1991 64 p
(AD-A246574) Avail: NTIS HC/MF A04

A six transceiver ocean acoustic tomography array was deployed to monitor ocean ventilation and circulation over the 1988-89 winter cooling season. A stochastic inverse method computer code, which attains a solution by minimizing mean square error, is used to perform inversions of the Greenland Sea tomography data. A computer simulated ocean is used to evaluate various aspects of system performance. We first consider the advantages and problems associated with using a ray theory based algorithm. Next, we made two adjustments to our inversion code and discuss the effects on system performance. The first adjustment allows for layers of different thicknesses in the inverse solution to increase the density of estimates in regions of interest. The second adjustment allows the estimator to expect variability of the unknown field to decrease exponentially with depth. The ray theory based algorithm is an adequate method of modeling ray paths in the Greenland Sea, but has limitations. Reliability of ray paths degrades as launch angles become shallower and if strong gradients and rapidly changing gradients in sound speed are present in the vicinity of the transceiver elements. A set o' Greenland Sea data between one transceiver pair was processed. Although only three groups of eigenrays are involved, initial inversion results indicate the estimator detects seasonal variations and synoptic scale events occurring at time scales greater than 20 days, however, solutions show wide fluctuation GRA

N92-27547# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
SIMULATION OF THE SEASONAL ARCTIC SEA-ICE COVER WITH A DYNAMIC THERMODYNAMIC SEA-ICE MODEL
David M. Holland, Lawrence A. Mysak, and Josef M. Oberhuber Oct. 1991 78 p Sponsored by Atmospheric Environment Service; Natural Sciences and Engineering Research Council; ONR; Commission of the European Communities; and BMFT
(CGCR-91-17; CTN-92-60520) Avail: NTIS HC/MF A05

A numerical simulation of the seasonal ice cover in the Arctic Ocean and adjacent seas is presented. The sea ice model is extracted from Oberhuber's 1990 coupled sea ice - mixed layer - isopycnal general circulation model and is written in spherical coordinates. The advantage of such a model over previous sea ice models is that it can be easily coupled to either global atmospheric or ocean general circulation models written in spherical coordinates. In this model, the thermodynamics are a modification of that of Parkinson and Washington (1979) while the dynamics use the full Hibler (1979) viscous-plastic rheology. Monthly thermodynamic and dynamic forcing fields for the atmosphere and ocean are specified. The time integration is carried out using a predictor - corrector technique combined with a semi-implicit scheme. Requirements for stable integration on the spherical grid with respect to choice of time step increment, numerical diffusion coefficient, and viscosities are given. The simulations of the seasonal cycle of ice thickness, compactness, and velocity compare favorably with the known seasonal characteristics of these fields. Author (CISTI)

N92-27548# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
SIMULATION OF THE SEASONAL ARCTIC SEA-ICE COVER WITH A DYNAMIC THERMODYNAMIC SEA-ICE MODEL
Davinder K. Manak and Lawrence A. Mysak Jul. 1990 78 p Sponsored by Atmospheric Environment Service; Natural Sciences and Engineering Research Council; and ONR
(CGCR-90-10; CTN-92-60521) Avail: NTIS HC/MF A05

A dynamic thermodynamic numerical sea-ice model extracted from Oberhuber's (1990) coupled ice-ocean model for the simulation of sea-ice circulation, thickness, and concentration is described. The sea-ice model in the uncoupled mode is driven with mean monthly climatological forcing fields. The momentum balance describing ice drift and deformation consists of the Coriolis force, ocean tilt, wind and water stresses, and an internal ice resistance term. The ice thickness and compactness are treated as continuous variables. Simulation results from a 10-year integration with monthly climatological forcing are presented. A 10-year period was sufficient to spin up the model to a steady seasonal cycle. The seasonal cycles of ice thickness and sea-ice extent compare favorably with observations. Author (CISTI)

N92-27549# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
EXPERIMENTS WITH A COUPLED, ZONALLY AVERAGED ATMOSPHERE-OCEAN MODEL: VARIABILITY OF THE THERMOHALINE CIRCULATION
Thomas F. Stocker, Daniel G. Wright, and Lawrence A. Mysak Jun. 1990 25 p Sponsored by Swiss National Science Foundation; Natural Sciences and Engineering Research Council; and Atmospheric Environment Service
(CGCR-90-4; CTN-92-60522) Avail: NTIS HC/MF A03

Two experiments with a recently developed zonally averaged climate model which includes the ocean's thermohaline circulation are performed. The first simulates a global thermohaline circulation in which deep water is formed in the North Atlantic and flows as a deep current into the Pacific basin where it upwells. The water is returned as a near-surface flow through the Indian Ocean into the South Atlantic. The present model confirms the hypothesis of a global deep circulation under present-day forcing, and it is shown that the atmospheric water vapor transport is of importance. The second experiment studies the effect of glacial meltwater runoff at different latitudes on the thermohaline circulation, meridional heat flux, and surface air temperature. Depending on the strength

and position of the forcing anomaly, severe cooling can be observed in high northern latitudes. The mechanism may provide further insight into the Younger Dryas climate event. CISTI

N92-27574# Naval Oceanographic and Atmospheric Research Lab., Bay Saint Louis, MS.
MONTHLY MEAN SEA ICE DATA FROM THE POLAR ICE PREDICTION SYSTEM, THE REGIONAL POLAR ICE PREDICTION SYSTEM (BARENTS SEA), AND THE REGIONAL POLAR ICE PREDICTION SYSTEM (GREENLAND SEA) Final Report
P. G. Posey and R. H. Preller Nov. 1991 144 p
(NR Proj. X05-013)
(AD-A246145; AD-E040168; NOARL-TN-196) Avail: NTIS HC/MF A07

The Polar Ice Prediction System (PIPS), the Regional Polar Ice Prediction System-Barents (RPIPS-B), and the Regional Polar Ice Prediction System-Greenland (RPIPS-G) are all operational sea ice forecasting systems that began running daily at the Fleet Numerical Oceanography Center (FNOC) on Sep. 1987, Jun. 1989, and Oct. 1991, respectively. The basis for all three models is the Hibler ice mode. The ice models are driven by monthly mean ocean currents and deep ocean heat fluxes derived from the a coupled ice-ocean model. They are also driven by atmospheric forcing from the Navy Operational Global Atmospheric Prediction System (NOGAPS). Each day a 24-hour forecast of PIPS, RPIPS-B, and RPIPS-G is submitted and archived by Naval Oceanographic and Atmospheric Research Laboratory (NOARL). This technical note contains monthly mean values of geostrophic winds, ice drift, ice thickness, and ice concentration derived from the PIPS and RPIPS-B 24-hour forecast from 1990 and 1991; and 24-hour forecast form RPIPS-G from 1991. GRA

N92-27575# Naval Oceanographic and Atmospheric Research Lab., Bay Saint Louis, MS.
THREE-DIMENSIONAL OCEAN THERMAL STRUCTURE (TOTS) SOFTWARE MODULE SOFTWARE REQUIREMENTS SPECIFICATIONS Final Report
Chung-Chu Teng (Sverdrup Technology, Inc., Bay Saint Louis, MS.), M. R. Carnes, J. D. Hawkins, and P. A. Phoebus Dec. 1991 25 p
(AD-A246146; AD-E040166; NOARL-TN-207) Avail: NTIS HC/MF A03

The Tactical Environmental Support System (TESS(3)) is gearing up to receive and process digital imagery, visible and infrared, from the civilian and military polar orbiter meteorological satellites. Real-time data from the National Oceanic and Atmospheric Administration (NOAA) Advanced Very High Resolution Radiometer (AVHRR) and the Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS) sensors will be used for a variety of applications. The Three-dimensional Ocean Thermal Structure (TOTS) software module described here uses the infrared imagery to derive ocean front and eddy positions and then incorporates feature models of the eddies and fronts to create synthetic profiles of temperature versus depth. These observations fill a critical gap in our knowledge of the real-time thermal field. The ability to combine this information with all in situ reports and generate a 3D volume of temperature and sound speed is detailed for subsequent input to acoustic models. GRA

N92-27583# Oregon State Univ., Corvallis. Dept. of Civil Engineering.
CHAOTIC AND RANDOM RESPONSES OF OCEAN STRUCTURAL SYSTEMS Final Technical Report
Solomon C. Yim 1 Mar. 1992 13 p
(Contract N00014-88-K-0729)
(AD-A247561) Avail: NTIS HC/MF A03

The long-term goals of the research project were to develop a systematic analysis and design procedure for nonlinear ocean structural systems unifying both the deterministic and stochastic approaches. The procedure would provide a basis for: (1) analyzing the system response to combined periodic and stochastic excitations, (2) estimating the likelihood of chaotic response and developing guidelines for field observations, (3) predicting long-term extreme values of chaotic and stochastic responses based on measured data, and (4) ultimately, developing design methods to take into account both chaotic and stochastic behavior of compliant ocean systems. The near-term goals for the research were first to develop and analyze basic nonlinear ocean system models to understand their deterministic chaotic behavior, and then to extend the basic models to include stochastic aspects. Efforts focused on: (1) developing analytical models of compliant structural systems to understand the physics of chaotic behavior, (2) determining the existence and range of chaotic response of compliant structural systems under combined periodic and stochastic excitations; and (3) validating analytical results experimentally. GRA

N92-27604# Institute for Naval Oceanography, Bay Saint Louis, MS.
COMPARISON OF GULF STREAM FORECAST MODEL INITIALIZATION AND VERIFICATION ANALYSES
Scott M. Glenn, Dick Crout (Planning Systems, Inc., Slidell, LA.), and Louise Perkins Oct. 1991 42 p
(NR Proj. R31-0300)
(AD-A246218; AD-E040178; INO-TM-6) Avail: NTIS HC/MF A03

The initialization and verification of Gulf Stream forecast models was begun jointly by Harvard and NOARL in 1988. The six case studies were chosen by determining which time periods had both the REX GEOSAT underflight AXBT surveys and good IR coverage. The data was used to generate Gulf Stream axis location and the warm and cold ring locations spaced at one-week intervals. The analysis domain extended from approximately 74W to 54W. The strength of the total data set is that coverage by any single data set in this region is patchy. After preliminary tests, it was decided that additional data was needed to better locate the Stream axis. It was also necessary to add error bars on the frontal analysis. Preliminary comparisons of the NOARL and Harvard analyses indicated that, although some analyses agreed quite well, others were very different. GRA

N92-27621# Dalhousie Univ., Halifax (Nova Scotia).
SUBINERTIAL CIRCULATION ON THE SCOTIAN SHELF OBSERVATIONS AND MODELS Ph.D. Thesis
Franklin B. Schwing Oct. 1989 225 p
(ISBN-0-315-56167-X; CTN-92-60461) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Data from the Canadian Atlantic Storms Program field experiment (November 1985-April 1986) are analyzed to discern important scales and patterns of the subsurface pressure (SSP) and velocity response to local and non-local meteorological forcing. Observations are characterized by subinertial motions coherent with both local wind forcing and remotely generated signals that propagate onto the Scotian Shelf from the east. The large-scale current response is geostrophic, however velocity variations on the scale of 50-100 km are not reflected in the SSP; irregular shelf topography induces modifications in the circulation not manifested in the SSP signal. A hierarchy of analytical and numerical models were developed to examine the influence of steady and time-dependent wind forcing and coastally trapped wave (CTW) activity on shelf circulation and flow topography interaction. The relative importance of friction, advection and the Earth's rotation were also investigated. A linear, depth integrated barotropic circulation model successfully explains locally and non-locally forced variations in SSP and velocity data, but is particularly good at reproducing the spatially coherent SSP field. The most important results of the study are direct evidence of CTWs on the Scotian Shelf, and an understanding of bathymetrically steered flow that cannot be obtained using modal techniques. It is concluded that both local and non-local forcing must be considered to adequately model shelf circulation, and circulation on topographically irregular shelves is generally much

too complex to be explained by a few wave numbers.
Author (CISTI)

N92-27666# Naval Postgraduate School, Monterey, CA.
MONTHLY MEAN TIME SERIES OF TEMPERATURE AND SALINITY IN MONTEREY BAY, 1951-1991 M.S. Thesis
Feng-Yu Kuo Dec. 1991 91 p
(AD-A246444) Avail: NTIS HC/MF A05

Temperature and salinity profile data, collected from different sources over the last four decades (1951-1991), were compiled and processed to obtain monthly mean time series of thermal conditions in Monterey Bay. The results indicate: (1) Near surface low salinity water intruded into the Bay from offshore during January to April, especially during March; (2) Annual cycle of monthly regression T-S curves, obtained by least-squares method, showed seasons cycle in the Bay, and missing salinity data can be filled by regression equations of salinity on temperature; and (3) Anomalously high temperature water occurred in some years which had two different time patterns. In the upper layer, shallower waters lead in time whereas in the deep water, deeper waters always lead. These two time patterns are believed to be associated with local forcing (weather conditions) and remote forcing (coastal trapped waves) respectively. GRA

N92-27667# Naval Oceanographic Office, Bay Saint Louis, MS.
NATIONAL OCEANOGRAPHIC FLEET PLATFORM CHARACTERISTICS Final Report
Jan. 1992 265 p Supersedes NOO-RP-34(91)
(AD-A246452; NOO-RP-53; NOO-RP-34(91)) Avail: NTIS HC/MF A12

This publication presents the 1992 platform characteristics for the national oceanographic fleet. Information is provided for over 90 ships which operate under various academic, governmental, or commercial organizations. Included with each ship is information on ship characteristics and engineering/deck equipment, and a point of contact. Future editions will not contain ship schedule information. GRA

N92-27786# Naval Postgraduate School, Monterey, CA.
DETERMINATION OF NEAR-SURFACE VELOCITY FIELDS IN THE CTZ USING COMBINED ALTIMETRIC AND INVERSE MODELLING TECHNIQUES M.S. Thesis
Douglas Michael Taggart Mar. 1991 53 p
(AD-A246066) Avail: NTIS HC/MF A04

An inverse model involving the advanced very high resolution radiometer (AVHRR) imagery and the heat equation with dynamical constraints on the divergence, kinetic energy and vorticity of the solutions was used by Kelly (1989) to produce velocity fields that were in good agreement with Acoustic Doppler Current Profiler (ADCP) data. Dynamic heights derived from GEOSAT radar altimeter data have also been used to determine near-surface geostrophic currents. Synthetic GEOSAT-derived velocity data was generated from ADCP data collected as part of the Coastal Transition Zone (CTZ) Field Program. The inverse model was run with AVHRR imagery that was coincident to the CTZ Field Program ADCP data and the synthetic velocity data was added as an additional constraint on the model's solution. The resulting velocity solutions were much improved over those given by the inverse model alone. Refinement of this method involving a combination of different data sources should improve efforts to determine near-surface velocities of the ocean entirely by remote means. GRA

N92-27820# Coastal Engineering Research Center, Vicksburg, MS. Waterways Experiment Station.
HINDCAST WAVE INFORMATION FOR THE GREAT LAKES: LAKE ONTARIO Final Report
Robin D. Reinhard, David B. Driver, and Jon M. Hubertz Dec. 1991 339 p
(AD-A246446; CERC-WIS-25) Avail: NTIS HC/MF A15

The primary purpose of this study is to provide an accurate and comprehensive data base of information descriptive of the long-term wave climate for the Great Lakes. The goal is to accurately represent mean values of wave parameters such as height, period, and direction. At any station, the hindcast values are expected to differ at times from measured values, but this difference will generally be small and, in the mean, approach zero. It is also expected that the extreme values at any station will accurately represent actual conditions and provide reliable design wave information. This report describes the selection of a grid and hindcast sites, methods used to process and prepare input wind fields, numerical model calibration and verification, and production of a 32-year (1956-1987) hindcast. Information of this nature is essential to efforts in developing workable shoreline management guidelines and navigational aids. Projects benefitting from such information include dredging and dredge disposal, beach nourishment and erosion studies, and the design of coastal structures such as jetties, harbors, revetments, and breakwaters, as well as local projects for improving recreation safety. GRA

N92-27908# Lamont-Doherty Geological Observatory, Palisades, NY.
USING SEAFLOOR ARRAYS TO MEASURE SEDIMENT SEISMOACOUSTIC AND GEOTECHNICAL PROPERTIES
Robert D. Stoll 1991 5 p
(Contract N00014-89-J-1152)
(AD-A247804) Avail: NTIS HC/MF A01

In this paper a robust seismic technique for remote sensing of certain properties such as p- and s-wave velocity and attenuation as a function of depth in the uppermost sediments (25 to 50 m below the seafloor) is described. The technique utilizes an impulsive source and an array of gimbaled geophones sensitive to vertical and horizontal velocity. Both the source and receivers are deployed on the seafloor and, so far, we have successfully obtained data at water depths ranging from 3 m to over 200 m. To obtain estimates of the bottom properties as a function of depth, both refracted p- and s-waves as well as interface-waves (Scholte/Stoneley) are analyzed. Inversion of the data is carried out using modified versions of the inversion techniques developed by earthquake seismologists and geophysicists to study dispersed Rayleigh-waves and refracted waves. GRA

N92-27930*# National Aeronautics and Space Administration. Wallops Flight Facility, Wallops Island, VA.
A SELF-ZEROING CAPACITANCE PROBE FOR WATER WAVE MEASUREMENTS
Steven R. Long Jun. 1992 45 p
(NASA-RP-1278; Rept-92B00058; NAS 1.61:1278) Avail: NTIS HC/MF A03

The wave probe developed at the Air-Sea Interaction Research Facility was designed to measure the surface elevation fluctuations of water waves. Design criteria included being linear in response, self-zeroing to the mean water level, having multiple operating ranges so that the instrument's maximum output could be matched to the maximum surface elevation over varying conditions, and be as noise-free as possible. The purpose of this publication is to provide a detailed description of the design and construction of this probe. Author

N92-28010# Harvard Univ., Cambridge, MA. Div. of Applied Sciences.
ASSIMILATION MODELING OF COASTAL TRANSITION ZONE DATA AND CONTINENTAL SLOPE FLOW FIELDS Final Technical Report
John S. Allen and Leonard J. Walstad 1991 2 p
(Contract N00014-90-J-1051)
(AD-A248692) Avail: NTIS HC/MF A01

Linear analysis of Coastal Transition Zone jet profiles indicates that 150 km and less wavelength instabilities are predominantly barotropic, while for wavelengths 200 km and greater the fastest growing modes have nearly equal contributions from barotropic and baroclinic energy conversions. Physical mechanisms for retention and accumulation of biomass at fronts have been identified and explored. Results of intermediate model (IM) studies applied to the shallow-water equations show that the IM equations

may be solved numerically with appropriate boundary conditions to correctly represent ageostrophic coastally-trapped wave dynamics. GRA

N92-28108# Naval Postgraduate School, Monterey, CA.
ACOUSTIC SENSING OF OCEAN TURBULENCE M.S. Thesis
Emanuel F. Coelho Dec. 1991 30 p
(AD-A246752) Avail: NTIS HC/MF A03

The need for direct turbulence measurements in the upper ocean arise from widespread requirements to correctly parameterize momentum and scalar fluxes across the air/ocean interface. Until recently these observations were limited by a lack of instrumentation capable of measuring the fine-structure velocity field down to dissipation scales. The recently developed CDV package allows simultaneous sub-centimeter resolution measurements of temperature, conductivity, pressure, shear, and the 3 component velocity field. As part of the development of this system a Monte-Carlo simulation was used to analyze the performance of several spectral estimators of the mean acoustic Doppler shifts, from which the velocity components are derived. The selected algorithms were implemented on a Digital Signal Processor allowing real-time estimation of the velocity, shear, and scalar quantities. To verify the performance of the CDV package, it was deployed off Wharf 2 in Monterey for 24 hours while simultaneously recording meteorological data. Reynold's stresses, buoyancy fluxes, and fine scale stratification were characterized and the surface gravity wave field identified. GRA

N92-28199# McGill Univ., Montreal (Quebec). Centre for Climate and Global Change Research.
THE OCEAN'S THERMOHALINE CIRCULATION: ITS STABILITY, VARIABILITY, AND ROLE IN CLIMATE
Tertia M. C. Hughes Aug. 1991 52 p
(CGCR-91-12; CTN-92-60529) Avail: NTIS HC/MF A04

A review is presented to summarize some of the results from the hierarchy of models of the uniqueness of the present-day thermohaline circulation in the world oceans. The factors governing the stability or variability of the thermohaline circulation are explored and its role in regulating the global climate is evaluated. The Strommel-Arons theory of the deep circulation is discussed and the process of deep water formation is identified as the driving force in the thermohaline circulation. A number of box-type models are then reviewed, which indicate that several distinct equilibria are possible under the same boundary conditions. The main limitation of these models is their emphasis on the steady state. General circulation models take into account non-steady state effects and two important aspects of thermohaline circulation are made evident: the interaction with the wind-driven circulation and the importance of vertical stratification. Coupled models which introduce a link to climate and indicate that temperature anomalies as well as salinity anomalies may have a significant effect on the stability of the thermohaline circulation. CISTI

N92-28023*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AIRSAR OBSERVATIONS OF THE GULF STREAM WITH INTERPRETATION FROM SEA TRUTH AND MODELING
G. R. Valenzuela, S. R. Chubb, G. O. Marmorino, C. L. Trump, J. S. Lee, A. L. Cooper, F. Askari, W. C. Keller, J. A. C. Kaiser, and R. P. Mied (Naval Research Lab., Washington, DC.) et al *In its* Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop 1 Aug. 1991 p 98-108 Prepared in cooperation with NADC, Warminster, PA, North Carolina State Univ., Raleigh, ERIM, Ann Arbor, David Taylor Research Center, Bethesda, MD, Naval Oceanographic and Atmospheric Research Lab., Bay Saint Louis, MS, Univ. of Southern Mississippi (For primary document see N92-28013 18-43)
Avail: NTIS HC/MF A11

51 LIFE SCIENCES (GENERAL)

N92-27877*# Bionetics Corp., Cocoa Beach, FL.
A SUMMARY OF POROUS TUBE PLANT NUTRIENT DELIVERY SYSTEM INVESTIGATIONS FROM 1985 TO 1991
T. W. Dreschel, C. S. Brown, W. C. Piastuch, C. R. Hinkle, J. C. Sager, R. M. Wheeler, and W. M. Knott Jan. 1992 37 p
(Contracts NAS10-10285; NAS10-11624)
(NASA-TM-107546; NAS 1.15:107546) Avail: NTIS HC/MF A03

The Controlled Ecological Life Support System (CELSS) Program is a research effort to evaluate biological processes at a one person scale to provide air, water, and food for humans in closed environments for space habitation. This program focuses currently on the use of conventional crop plants and the use of hydroponic systems to grow them. Because conventional hydroponic systems are dependent on gravity to conduct solution flow, they cannot be used in the microgravity of space. Thus, there is a need for a system that will deliver water and nutrients to plant roots under microgravity conditions. The Plant Space Biology Program is interested in investigating the effect that the space environment has on the growth and development of plants. Thus, there is also a need to have a standard nutrient delivery method for growing plants in space for research into plant responses to microgravity. The Porous Tube Plant Nutrient Delivery System (PTPNDS) utilizes a hydrophilic, microporous material to control water and nutrient delivery to plant roots. It has been designed and analyzed to support plant growth independent of gravity and plans are progressing to test it in microgravity. It has been used successfully to grow food crops to maturity in an earth-bound laboratory. This document includes a bibliography and summary reports from the growth trials performed utilizing the PTPNDS. Author

N92-27322*# Oklahoma State Univ., Stillwater.
FINAL RESULTS OF THE SPACE EXPOSED EXPERIMENT DEVELOPED FOR STUDENTS (SEEDS) P-0004-2 Abstract Only
Doris K. Grigsby *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 121
(For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27323*# Park Seed Co., Inc., Greenwood, SC.
CONTINUED RESULTS OF THE SEEDS IN SPACE EXPERIMENT Abstract Only
Jim A. Alston *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 122
(For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

N92-27349# California Univ., Berkeley. Lawrence Berkeley Lab.
THE CARCINOGENIC RISKS OF LOW-LET AND HIGH-LET IONIZING RADIATIONS
J. I. Fabrikant Aug. 1991 37 p Presented at the 32nd Annual Meeting of the Japan Radiation Research Society, Kitakyushu-shi, Japan, 29 Aug. 1989 Revised
(Contract DE-AC03-76SF-00098)
(DE92-010477; LBL-27728-Rev; CONF-8908169-1) Avail: NTIS HC/MF A03

This report presents a discussion on risk from ionizing radiations to human populations. Important new information on human beings has come mainly from further follow-up of existing epidemiological studies, notably the Japanese atomic bomb survivors and the ankylosing spondylitis patients; from new epidemiological surveys, such as the patients treated for cancer of the uterine cervix; and

from combined surveys, including workers exposed in underground mines. Since the numerous and complex differences among the different study populations introduce factors that influence the derived risk estimates in ways that are not completely understood, it is not clear how to combine the different risk estimates obtained. These factors involve complex biological and physical variables distributed over time. Because such carcinogenic effects occur too infrequently to be demonstrated at low doses, the risks of low-dose radiation can be estimated only by interpolation from observations at high doses on the basis of theoretical concepts, mathematical models, and available empirical evidence, primarily the epidemiological surveys of large populations exposed to ionizing radiation. In spite of a considerable amount of research, only recently has there been an effort to apply the extensive laboratory data in animals to define the dose-incidence relationship in the low dose region. There simply are insufficient data in the epidemiological studies of large human populations to estimate risk coefficients directly from exposure to low doses. The risk estimates for the carcinogenic effects of radiation were, in the past, somewhat low, and reassessment of the numerical values is now necessary. DOE

N92-27361# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
ARTERIO-VENOUS ANASTOMOSES AND THERMOREGULATION Final Report [ARTERIO-VENEUZE ANASTOMOSEN EN THERMOREGULATIE]
H. A. M. Daanen 22 Aug. 1991 20 p
(AD-A245385; IZF-1991-B-12; TDCK-TD-91-3296) Avail: NTIS HC/MF A03

In a cold environment, human heat loss is reduced by peripheral vasoconstriction, counter-current heat exchange, and a change of peripheral circulation pattern. However, these mechanisms go at the expense of the tissue temperature in the extremities. The cooling can be so pronounced that local cold injuries occur. Cold induced vasodilation (CIVD) may be regarded as an effective protection against local cold injury. The underlying mechanism is often associated with the presence of arterio-venous anastomoses (AVA). Rhythmic relaxation and contraction of the strong muscular wall of the AVA is often supposed to cause the hunting response in CIVD. The contraction phase is probably caused by stimulation of the alpha-adrenoceptors in the smooth muscle wall. Relaxation may be caused by a nervous blockade of the sympathetic system. There is no scientific evidence for humeral mediators. The influence of the body temperature on the vasomotor tone of the AVA remains to be investigated. The locations of AVA and the sites where CIVD occurs are not in perfect correspondence and also this point needs further research. GRA

N92-27371# Naval Air Development Center, Warminster, PA. Air Vehicle and Crew Systems Technology Dept.
THE SCOPE OF ACCELERATION-INDUCED LOSS OF CONSCIOUSNESS RESEARCH Final Report, May 1988 - May 1991
James E. Whinnery 4 Jul. 1991 16 p
(AD-A247872; NADC-91079-60) Avail: NTIS HC/MF A03

Acceleration induced loss of consciousness (G-LOC) is a major fighter aviation medicine problem. To effect an ultimate solution for G-LOC it is critical to have a thorough understanding of the problem. Research related to unconsciousness is spread across a multitude of disciplines. It is, therefore, a valuable exercise to develop the overall scope of relevant research that pertains to G-LOC. This not only serves to bring together the body of information that is important for understanding G-LOC, it also provides for the development of the scope of importance that G-LOC research has for other specific and clinical disciplines. The purpose of this review is to establish the relationship between biomedical research whose primary goal is aviation oriented and the clinical and basic research that is intricately associated with unconsciousness and may benefit from the results of G-LOC research. GRA

N92-27433* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 361)
Apr. 1992 56 p
(NASA-SP-7011(361); NAS 1.21:7011(361)) Avail: NTIS HC A04; NTIS standing order as PB92-912300, A03

This bibliography lists 141 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Mar. 1992. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author

N92-27702# Concordia Univ., Montreal (Quebec). Dept. of Biology.
DIMINISHING RADIATION DAMAGE AND ENHANCING IMMUNE SYSTEM RECOVERY: A STUDY Final Report, 1 Jan. 1989 - 28 Feb. 1991
R. M. Roy 21 Mar. 1991 31 p
(Contract DSS-055SS.W7714-8-5726)
(DREO-CR-91-646; CTN-92-60494) Avail: NTIS HC/MF A03

The modifying effects of tocopherol, lipoic acid, lithium carbonate, nicotinamide, 3-amino benzamide, sodium linoleate and sodium succinate administered to primary splenic lymphocytes at various concentrations, times, and in combinations were evaluated with respect to several parameters of radiation damage and recovery. With respect to interphase death, tocopherol, lithium carbonate and lipoic acid were clearly effective in reducing lethality when administered 0-12 hours after irradiation. A similar pattern of response modification was observed with respect to proliferative response to mitogens. The effects are more dramatic than those with interphase death and persist for at least 12 hours after irradiation in the case of lithium carbonate and at least 24 hours for tocopherol and lipoic acid. It was not possible to demonstrate repair of sublethal damage in irradiated lymphocytes. For lymphocyte humoral and cell-mediated immune functions, using in-vitro assays, tocopherol, lithium carbonate and lipoic acid may confer some stimulation of plaque-forming cell numbers in response to immunization. Chromium-51 release from labeled tumor target cells by irradiated sensitized lymphocytes is only affected, and only slightly, by nicotinamide. Author (CISTI)

N92-27844# Medical Coll. of Virginia, Richmond. Dept. of Neurology.
THE EFFECTS OF HYDRAZINES ON NEURONAL EXCITABILITY Annual Report, 1 May 1988 - 31 May 1989
Robert J. DeLorenzo 10 Jan. 1992 21 p
(Grant AF-AFOSR-0235-87)
(AD-A247103; AFOSR-92-0110TR) Avail: NTIS HC/MF A03

Hydrazines are toxic compounds which have numerous military and industrial applications including missile propellants, and advanced aircraft (such as the F-16), and space vehicles. Because of recurrent exposure, due to routine storage and disposal of these compounds, understanding their toxic effects on the nervous system is important in the aerospace field. Toxic exposure to hydrazine can result in status epilepticus and eventual respiratory collapse. Acute hydrazines exposure can produce repeated tonic-clonic seizures in animals and man. This project has continued to direct its effort in understanding the molecular mechanism by which hydrazines may produce their neuronal excitatory effects. We have continued and expanded our investigation of the effects of hydrazine on specific electrophysiological properties on identified neurons in the invertebrate Hermissenda Crassicornis and have expanded these studies to investigate the effects of hydrazine on isolated neurons in culture. Our studies have documented that hydrazines increase neuronal excitability in the LP-1 neuron of this nudibranch mollusc. Studies have been directed at further establishing the technical capability of investigating the effects of hydrazines on the rate of sustained repetitive firing. GRA

N92-27968# Rochester Univ., NY. Center for Visual Science.
REFERENCE FRAMES IN VISION Annual Report, 15 Jan. 1991 - 14 Jan. 1992
Mary M. Hayhoe 18 Mar. 1992 6 p
(Grant AF-AFOSR-0332-91)
(AD-A248743; Rept-5-27959; AFOSR-92-0264) Avail: NTIS HC/MF A02

The goal of this project is to examine the consequences of observer motion for visual function. The research has focussed on two issues. One issue is how a grossly time-varying retinal input (because of eye, head, and body motion) results in the perception of a continuous and directionally stable visual world. A second issue concerns how the information in successive views is related, and the nature of the visual information retained from previous views. Understanding these processes is important for a wide variety of visual-motor tasks. In the past year progress has been made on the following six projects: (1) the role of the visual scene and eye position signals in visual stability; (2) the role of attention in integrating across saccades; (3) reference frames for spatial memory; (4) hand-eye coordination during complex tasks; (5) detectability of changes during saccades; and (6) short term visual memory of complex scenes. GRA

N92-28135# Armed Forces Inst. of Pathology, Washington, DC.
INSPIRED GAS COMPOSITION INFLUENCES RECOVERY FROM EXPERIMENTAL VENOUS AIR EMBOLISM Annual Report, 1 Jul. 1990 - 30 Jun. 1991
Joseph A. Bettencourt, Charles M. Harrison, Theodore Plemons, Patricia L. Schleiff, and William J. Mehm 30 Jun. 1991 22 p
(Grant AF-AFOSR-0317-90)
(AD-A247004; AFOSR-92-0134TR) Avail: NTIS HC/MF A03

Venous air embolism (VAE) is a potentially fatal occurrence frequently encountered in neurosurgical procedures performed in the sitting position. The morbidity of this event was reduced primarily by efforts at early detection and prevention. Clinically, VAE is accompanied by hypoxia, hypercarbia, and an increase in dead space, manifested initially by a precipitous fall in end tidal carbon dioxide (ETC02). Treatment consists of identifying and controlling the source, and hyperventilation on 100 percent oxygen. Hemodynamic support is given as required. A canine model of VAE was used to evaluate the effect of different inspired gas mixtures on the recovery from continuous venous air infusion. Sulfur hexafluoride (SF6), a non-hyperoxic, nitrogen free inspired gas was tested to determine if it would be a preferable alternative to recovery on 100 percent oxygen. Residual air effect was identified after the recovery period by a nitrous oxide challenge. In this study, recovery from VAE on 100 percent oxygen, as determined by response to nitrous oxide, was demonstrated to be significantly superior to either room air or SF6. ETC02, pulmonary artery diastolic pressure (PAD) and arterial oxygen tension (PaO2) all demonstrated a greater ability to tolerate the nitrous oxide challenge in subjects recovered with 100 percent oxygen. GRA

N92-28212*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
METABOLIC ENERGY REQUIREMENTS FOR SPACE FLIGHT
Helen W. Lane 1992 29 p
(NASA-TM-107933; NAS 1.15:107933) Avail: NTIS HC/MF A03

The international space community, including the USSR, Japan, Germany, the European Space Agency, and the US, is preparing for extended stays in space. Much of the research planned for space will be tended by humans, thus, maintaining adequate nutritional status during long stays in space has lately become an issue of much interest. Historically, it appears that minimum nutritional requirements are being met during stays in space. Thus far, crewmembers have been able to consume food adequate for maintaining nominal performance in microgravity. The physiological data obtained from ground-based and flight research that may enable us to understand the biochemical alterations that effect energy utilization and performance. Focus is on energy utilization during the Apollo lunar missions, Skylab's extended space lab missions, and Space Shuttle flights. Available data includes those recorded during intra- and extravehicular activities as well as during microgravity simulation (bed rest). Data on metabolism during flight and during bed rest are discussed, with a follow-up on human gastrointestinal function. Author

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N92-27331# California Univ., Berkeley. School of Optometry.
SPATIO-TEMPORAL MASKING: HYPERACUITY AND LOCAL ADAPTATION Annual Report, 1 Jan. 1990 - 31 Dec. 1991
Stanley A. Klein 5 Feb. 1992 5 p
(Grant AF-AFOSR-0238-89)
(AD-A246953; AFOSR-92-0131TR) Avail: NTIS HC/MF A01

Our development of an ideal-observer framework and a test-pedestal methodology for modeling vision without the numerous assumptions of previous models has provided a comprehensive understanding of the spatio-temporal characteristics of human vision. The methodology encompasses a limited set of test stimuli with a multiplicity of pedestals to facilitate the comparison of performance across many psychophysical tasks. For example, it is shown that vernier acuity can generally be predicted from an individual's contrast discrimination threshold. For the conditions under which contrast discrimination predictions break down, a detailed modeling of later stages of visual processing is required. As a result, specifications for a vision modeling tool have been developed to guide the creation of a comprehensive vision modeling environment. As our models of visual function have matured, we have applied them to practical issues such as image compression and image quality. Consideration of properties of human vision is essential if the image compression needed for new technologies such as HDTV are to avoid sacrificing image quality. The success of the test-pedestal methodology has also lead us to record human visual evoked potentials so that we may integrate our psychophysical data and models of vision with underlying physiological mechanisms. GRA

N92-27337# California Univ., Berkeley. Dept. of Psychology.
NORMS AND THE PERCEPTION OF EVENTS Annual Report, 15 Jun. 1990 - 5 Sep. 1991
Daniel Kahneman 5 Sep. 1991 33 p
(Grant AF-AFOSR-0206-88)
(AD-A247032; AFOSR-92-0103TR) Avail: NTIS HC/MF A03

The major effort of the research reported here has been been directed to understanding multiple representations in thinking and processes of comparison in different domains. Five distinct projects address issues of interpersonal versus intrapersonal comparisons, mental contamination, anchoring effects, topic and referent in perceptual comparison, and reference effects in choice. GRA

N92-27444# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
ATTENTIONAL DEMANDS AND EFFECTS OF EXTENDED PRACTICE IN A ONE-FINGER KEY-PRESSING TASK Final Report [AANDACHT EN EFFECTEN VAN OEFENING IN EEN SEQUENTIEELE TOETSDRUKTAAK]
W. B. Verwey 23 Oct. 1991 21 p
(AD-A245384; IZF-1991-B-15; TDCK-TD-91-3305) Avail: NTIS HC/MF A03

This paper attempts to define mechanisms for producing rapid movement sequences early and late in practice. Twelve subjects completed eight hours of practice on a task in which a response consisted of a sequence of three key presses, the first two of which were fixed over all trials while the third was stimulus dependent. In some dual task blocks a low or a high pitched tone was presented during various phases of sequence production in order to determine attentional demands of sequence preparation and execution. The results show that attentional resources are required for preparing but not for executing the sequence. Extended practice was found to gradually improve anticipation of response

production but no evidence was found for qualitative changes in the way the sequences were produced as suggested by notions of distributed programming and response integration. Secondary task interference reduced only little with practice. The present results provide further evidence for the notion that a general principle of producing movement sequences underlies one and multi-finger key press sequences. In contrast to assumptions of multiple resource theories about parallel processing the results suggest that when more than one task requires attention at the same time, limited attentional resources are and remain a major bottle-neck for dual task performance. This is evidence for a single channel model of task performance. GRA

N92-27500# Federal Aviation Administration, Washington, DC. Office of Aviation Medicine.

EFFECTS OF COLOR VISION DEFICIENCY ON DETECTION OF COLOR-HIGHLIGHTED TARGETS IN A SIMULATED AIR TRAFFIC CONTROL DISPLAY Final Report

Henry W. Mertens, Richard I. Thackray, and Mark Touchstone Jan. 1992 11 p

(AD-A246586; DOT/FAA/AM-92/6) Avail: NTIS HC/MF A03

The present study sought to evaluate the effects of color vision deficiency on the gain in conspicuity that is realized when color-highlighting is added as a redundant cue to indicate the presence of unexpected, nontracked aircraft intruding in controlled airspace. Sixteen subjects with severe color vision deficiency, both protan and deutan types, and eight subjects with normal color vision performed a simulated high-workload air traffic control task over a 1-hour period. Displayed information was normally green. In addition to the primary task, subjects also monitored for occasional intrusions by light aircraft identifiable on the basis of triangular shape alone or with the color red added as a redundant cue. The luminance of the red color was also 30 percent higher. Detection of red targets was slightly slower than detection of green targets in protans. In contrast, detection was faster with red targets for both normals and deutan subjects. Impairment in performance of the severe protans with red highlighting was attributed to their well known reduced sensitivity to red light. Although severe deutans have reduced color discrimination, they do not usually have reduced sensitivity, and their performance was probably enhanced by the greater brightness of red targets. These results demonstrate that the approach of using color always as a redundant cue to ensure performance of color deficients, is valuable, but the potential for adverse interaction of color coding with color deficiency must always be considered. GRA

N92-27501# Federal Aviation Administration, Washington, DC. Office of Aviation Medicine.

GENDER, EQUITY, AND JOB SATISFACTION Final Report

L. A. Witt and Lendell G. Nye Feb. 1992 12 p

(AD-A246588; DOT/FAA/AM-92/9) Avail: NTIS HC/MF A03

Although equity theory has served as a theoretical framework applying to most individuals in most situations, empirical research suggests that gender may affect the utility of equity theory in explaining organizational behaviors. Studies have indicated that men are more likely than women to distribute outcomes to individuals in direct proportion to their input. This gender difference has brought about considerable research interest and concern for implications in work groups and in supervisor-subordinate interactions. Brockner and Adsit noted an important but untested implication that the equity norm is more salient for men than it is for women. They argued that men's satisfaction with an exchange relationship should be influenced by the presence or absence of equity more so than women's satisfaction. They reported data indicating that the equity-satisfaction relationship was considerably stronger among men than among women. The Brockner and Adsit finding has an important implication for organization theory, namely that equity perceptions may be more salient among men than women in the development of job satisfaction. Replication of their findings would suggest a need for further research in this area and a possible utility of different strategies for managing men and women for purposes of promoting job satisfaction with a focus on equity-related issues and antecedents. GRA

N92-27509# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Psychology.

WHAT AND WHERE IN VISUAL ATTENTION: EVIDENCE FROM THE NEGLECT SYNDROME

Martha J. Farah, Marcie A. Wallace, and Shaun P. Vecera Jan. 1992 36 p

(Contract N00014-91-J-1546)

(AD-A246932; CN-ONR-1) Avail: NTIS HC/MF A03

From what types of visual representations does attention select stimuli for further processing? Two alternatives that have been investigated within cognitive psychology are: array, or location-based representations, and object-based representations. We briefly review the literature on this issue in normal subjects, and then report two experiments on the same issue using parietal-damaged patients with visual neglect. The findings from neglect patients are then discussed with respect to the clinical literature on the effects of bilateral parietal damage, and the classical distinction between the spatial functions of the dorsal visual system and the object identification functions of the ventral system. GRA

N92-27512# California Univ., Berkeley.

INVESTIGATION OF DYNAMIC ALGORITHMS FOR PATTERN RECOGNITION IDENTIFIED IN CEREBRAL CORTEX Final Report, 1 Sep. 1988 - 31 Aug. 1991

Walter J. Freeman 2 Dec. 1991 9 p

(Grant AF-AFOSR-0268-88)

(AD-A247860; AFOSR-92-0112TR) Avail: NTIS HC/MF A02

Patterns of 40 to 80 Hz oscillation have been observed by researchers of this laboratory in the large scale activity not only of olfactory cortex, but also visual neocortex, and shown to predict the olfactory and visual pattern recognition responses of a trained animal. Similar observations of 40 Hz oscillation in auditory and motor cortex, and in the retina and EMG have been reported. Thus, it appears that cortical computation in general may occur by dynamical interaction of resonant modes, as we have long thought to be the case in the olfactory system. The oscillation can serve a macroscopic clocking function and entrain or 'bind' the relevant microscopic activity of disparate cortical regions into a well defined phase coherent collective state of 'gestalt'. This can override irrelevant microscopic activity and produce coordinated motor output. We have further evidence that the oscillatory activity is roughly periodic, but actually appears to be chaotic (nonperiodic) when examined in detail. GRA

N92-27535# Naval Research Lab., Washington, DC.

DUAL-TASK PERFORMANCE AS A FUNCTION OF PRESENTATION MODE AND INDIVIDUAL DIFFERENCES IN VERBAL AND SPATIAL ABILITY Final Report

Lisa B. Achille, Astrid Schimidt-Nielsen, and Linda E. Sibert 31 Jan. 1992 24 p

(AD-A246611; NRL-9372) Avail: NTIS HC/MF A03

The effectiveness of alternative display formats as a function of individual differences in verbal and spatial abilities was evaluated in a dual-task paradigm. Tasks consisted of two dimensional tracking and a classification task in which items were presented as text, speech, or icons. Spatial ability was correlated with performance on the tracking task both for single task and for dual task in combination with the various presentation modes of the classification task. Verbal ability was not consistently correlated with performance on any of the tasks. Significant individual differences in dual task performance were found, and individuals were highly consistent with themselves across different presentation modes. Classification task performance is compared for the three presentation modes singly and in combination with the tracking task. Dual task classification was slower than single-task classification for the visual modes, but there was no increase in reaction time between single and dual task performance for speech. In the dual task conditions, the largest tracking performance decrements were found for the text conditions, with small decrements for speech, and smallest decrements for iconic presentations. Issues related to time sharing ability and strategies are also discussed. GRA

N92-27537# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
A META-ANALYSIS OF PILOT SELECTION TESTS: SUCCESS AND PERFORMANCE IN PILOT TRAINING M.S. Thesis
William E. Lynch Sep. 1991 74 p
(AD-A246623; AFIT/GLM/LSM/91S-44) Avail: NTIS HC/MF A04

The purpose of this study was to determine if the characteristics measured by the Air Force Officer Qualifying Test Pilot Composite and Navy/Marine Flight Aptitude Rating were significantly correlated to the successful completion of flight training. Meta-analysis was used to calculate the mean weighted average correlation, and correct for sampling error, error of measurement, restriction of range, and dichotomization. Over 200 studies were considered for the meta-analysis. The results indicate that both the uncorrected and fully corrected weighted mean correlations for a group of nine Air Force studies were statistically significant (p less than .0001). The partially corrected (sampling error and dichotomization) correlation for a group of eight Navy studies was also statistically significant (p less than .03), while the uncorrected weighted mean correlation was not significant (p greater than .05). There was no significant difference between the magnitude of the correlations (corrected and uncorrected) between the Navy and Air Force groups. The findings of this research indicate that both the Air Force Officer Qualifying Test Pilot Composite and Navy/Marine Flight Aptitude Rating are useful in selecting those candidates who are more likely to complete pilot training. GRA

N92-27538# California Univ., Irvine. Center for the Neurobiology of Learning and Memory.
FOURTH CONFERENCE ON THE NEUROBIOLOGY OF LEARNING AND MEMORY Final Report, 1 Jul. 1990 - 1 Feb. 1991
James L. McGaugh, Gary Lynch, Norman M. Weinberger, and Larry R. Squire 24 Feb. 1992 3 p Conference held in Irvine, CA, 17-20 Oct. 1990
(Contract N00014-90-J-4008)
(AD-A247174) Avail: NTIS HC/MF A01

This grant provided partial support for the Fourth Conference on the Neurobiology of Learning and Memory which was held at Irvine, California on October 17-20, 1990. The conference was organized and sponsored by the Center for the Neurobiology of Learning and Memory of the University of California, Irvine. The aim of the conference was to review current fact and theory concerning three research issues in the neurobiology of learning and memory: (1) the features and loci of patterns of brain activity induced by learning, (2) the roles of different brain systems in mediating learning and memory, and (3) cellular modifications underlying learning and memory. The presentations and discussions represented all levels of analysis from molecular neurobiology through systems/behavioral studies. There were 20 principal speakers, 98 poster presentations and over 300 registered participants representing 20 countries. A book based on the proceedings of the conference, Memory: Organization and Locus of Change (Larry R. Squire, Norman M. Weinberger, Gary Lynch and James L. McGaugh, Editors) is in press. GRA

N92-27822# Harvard Univ., Cambridge, MA. Dept. of Psychology.
PET STUDIES OF COMPONENTS OF HIGH-LEVEL VISION
15 Feb. 1992 3 p
(Contract N00014-91-J-1243)
(AD-A246449) Avail: NTIS HC/MF A01

We have now tested twelve subjects in an experiment in which we study how objects are identified when seen from an unusual point of view. As noted in earlier quarterly reports, this study will allow us to test a prediction of Kosslyn, Flynn, Amsterdam and Wang (1990); this theory led us to expect processes in the parietal lobe (involved in shifting attention) and in the frontal lobe (involved in formulating hypotheses) to be invoked when subjects identify pictures of object seen from an unusual point of view but not when objects are seen from canonical points of view. The subjects have participated in three conditions: (1) they see a series of pictures of objects seen from a canonical point of view; (2) they see a series of pictures of objects from an unusual point od view; (3) they see random noise patterns. In all three conditions, the subjects hear a word immediately before each picture is presented. In the first two conditions, they verify whether the word names the picture; in the third (baseline) condition, they simply press a pedal when they hear the word. GRA

N92-27825# University of Southern California, Los Angeles. Dept. of Psychology.
HUMAN IMAGE UNDERSTANDING Annual Progress Report, 1 Jun. 1989 - 22 Dec. 1990
Irving Biederman 18 Dec. 1991 22 p
(Grant AF-AFOSR-0231-88)
(AD-A247048; AFOSR-92-0135TR) Avail: NTIS HC/MF A03

An extensive series of experiments assessing the visual priming of briefly presented images indicates that the visual representation that mediates real-time object recognition specifies neither the image edges or vertices nor an overall model of the object, but an arrangement of simple volumes (or geons) corresponding to the object's parts. This representation can be activated with no loss in efficiency when the image is projected onto the retina at another position, size, or orientation in depth from when originally viewed. Consideration of these invariances suggests a computational basis for the evolution of two extrastriate visual systems, one for recognition and the other subserving motor interaction. The experiments suggest that it may be possible to assess the functioning of these systems behaviorally, that is, to split the cortex horizontally, through a comparison of performance on naming and episodic memory tasks. We have developed a neural network model that captures the essential characteristics of human object recognition performance. The model takes a line drawing of an object as input and generates a structural description which is then used for object classification. GRA

N92-27839# Yale Univ., New Haven, CT. School of Medicine.
STRESS-INDUCED ENHANCEMENT OF THE STARTLE REFLEX Annual Report, 1 Oct. 1990 - 30 Sep. 1991
Michael Davis 26 Dec. 1991 7 p
(Grant AF-AFOSR-0035-91)
(AD-A247096; AFOSR-92-0109TR) Avail: NTIS HC/MF A02

The goals of the research are to study neural systems involved in the production and inhibition of fear and anxiety. Previous research has found that the acoustic startle reflex is sensitive to both fear and stress. Many effects produced by fear or stress are mimicked by infusion of the peptide corticotropin releasing factor (CRF) directly into the brain. This year we have found that infusion of CRF into the brain causes a pronounced, dose-dependent enhancement of the acoustic startle reflex in rats. This excitatory effect was blocked by a CRF antagonist or by lesions of the amygdala, a brain structure known to be involved in fear and stress. The present data indicate that the amygdala is part of the neural circuitry required for CRF to elevate startle. Because startle is mediated by a well-defined neural pathway, CRF-enhanced startle is a useful behavioral assay to analyze the neural systems upon which exogenous CRF acts to produce its behavioral effects. GRA

N92-27863# Dayton Univ. Research Inst., OH.
AREA-OF-INTEREST DISPLAY RESOLUTION AND STIMULUS CHARACTERISTICS EFFECTS ON VISUAL DETECTION THRESHOLDS Final Technical Report, Dec. 1989 - Oct. 1990
Harold D. Warner, David C. Hubbard, and Gary Serfoss Feb. 1992 34 p
(Contract F33615-90-C-0005)
(AD-A247830; AL-TR-1991-0134) Avail: NTIS HC/MF A03

An investigation was conducted to examine the effects of area-of-interest (AOI) display resolution and various stimulus characteristics on visual detection thresholds using the Limited Field-of-View Dome (LFOVD) visual simulation system located at the Aircrew Training Research Division, Human Resources Directorate of the Armstrong Laboratory at Williams Air Force Base, Arizona. Two levels of AOI resolution, which was defined as the

width of the line spread function at 50 percent of the line's maximum luminance, were evaluated. The higher resolution level was 0.081 degree horizontal by 0.071 degree vertical, and the lower resolution level was 0.132 horizontal by 0.121 degrees vertical. The stimuli consisted of computer-generated striped and plain cylinder-shaped objects. The cylinders stood upright on the simulated terrain surface, and the stripes were placed midway between the top and bottom of the cylinders and completely encircled the cylinders. Detection thresholds were determined for both the cylinder stripes and the cylinders. The analysis of the cylinder stripes indicated that the threshold detection distances were greater with the higher resolution AOI and that the detection distances generally increased as stripe size, cylinder height, and cylinder diameter increased. The image generator load management parameters dictated the detection distances for the plain cylinders, except the smallest diameter cylinders. GRA

N92-27910# Aerospace Medical Research Labs., Brooks AFB, TX.
VISUAL ATTENTION AND PERCEPTION IN THREE-DIMENSIONAL SPACE Final Report, Apr. - Aug. 1990
Fred H. Previc, Lisa F. Weinstein, and Bruno G. Breitmeyer Jan. 1992 18 p
(AD-A247823; AL-TR-1991-0119) Avail: NTIS HC/MF A03

The effects of shifting attention to targets in 3-dimensional (3-D) visual space were investigated. The perceptibility of crossed-disparity (near) and uncrossed-disparity (far) targets located in the upper-left, upper-right, lower-left, and lower-right visual quadrants was measured during attention shifts that were directed by means of centrally presented arrows to the left or right, upper or lower, and near or far fields. Although left-right attention cues produced the expected perceptibility benefits, upper-lower cues produced no benefits and near-far ones produced attentional costs. The effect of shifting attention along the up-down axis using peripheral cues was also investigated; in this case, significant benefits were obtained, especially in the upper visual field. These results and those from basic detectability experiments point to the existence of important inhomogeneities in perceiving and attending to targets in 3-D visual space. GRA

N92-27969# Princeton Univ., NJ. Dept. of Psychology.
CAUSAL MODELS IN THE ACQUISITION AND INSTRUCTION OF PROGRAMMING SKILLS Final Report, Sep. 1987 - Aug. 1990
Brian J. Reiser Mar. 1992 42 p
(Contract MDA903-87-K-0652)
(AD-A248761; ARI-RN-92-90) Avail: NTIS HC/MF A03

This research project investigates how an interactive learning environment supports students' learning and acquisition of mental models when acquiring a target cognitive skill. For this project, we constructed GIL, an intelligent tutoring system for LISP programming. We used GIL to conduct pedagogical experiments on skill acquisition. Two ways in which an interactive learning environment will facilitate acquisition of novel complex domains were studied. The first set of studies examines how graphical representations provide a representation more congruent with students' reasoning. The second set examines how explanatory feedback, generated from the system's problem-solving knowledge, facilitates students' learning. The experiments demonstrate that computer-based support helps students construct effective models for reasoning in complex domains. GRA

N92-27971# Liege Univ. (Belgium). Lab. of Experimental Psychology.
BEHAVIORAL VARIABILITY, LEARNING PROCESSES, AND CREATIVITY Final Report, Sep. 1985 - Dec. 1988
Marc N. Richelle, Bruno Boulanger, Anne-Michelle Ingebos, and Martine Lahak Mar. 1992 433 p
(Contract DAJA45-85-C-0038)
(AD-A248894; Rept-0012; ARI-RN-92-18) Avail: NTIS HC/MF A19

This research investigates properties of human behavioral variability. The behavioral variability is discussed in the theoretical framework of learning theory, developmental psychology, and the psychology of intelligence and creativity. Relevant aspects of scientific literature are reviewed. Experiments investigate the effects of environmental factors on the variability of sequences of responses as a function of age, of cognitive capacities, and of educational background (for the adult subjects). Researchers used an experimental device that allowed for a number of equally efficient behaviors. Strategies used by subjects were recorded in various situations with differing degrees of constraint on freedom. Findings indicate that the performance, the variability, and the capacity to adapt to environmental contingencies are limited by the subjects' developmental level but they are not directly tied to cognitive capacities or cognitive styles. The mastery of the task seems to be slightly related to the educational background. The results suggest that variability is an inherent dimension of behavior, sensitive to its consequences, and that the potential for variation depends on the mastery of a set of basic behavioral units. The results support the idea that variability can be approached within the frame of learning theory and that, as a basic aspect of problem solving and creativity, it can be influenced by teaching. GRA

N92-27989# Kent State Univ., OH. Dept. of Biological Sciences.
INVOLVEMENT OF LIPID METABOLISM IN CHEMICAL TRANSMISSION PROCESSES AT MOSSY FIBER SYNAPSES Annual Report, 1 Jan. - 31 Dec. 1991
Robert V. Dorman 29 Jan. 1992 5 p
(Grant AF-AFOSR-0245-89)
(AD-A247198; AFOSR-92-0139TR) Avail: NTIS HC/MF A01

In 1991 we continued our investigations on the involvement of membrane lipid metabolism in the presynaptic processes related to the evoked release of the neurotransmitter glutamate. In particular, we observed that the phospholipase A2-dependent release of arachidonic acid from mossy fiber membrane phospholipids may modulate transmitter secretion through interactions with protein kinase c (PKC). The activation of PKC may explain the previously observed facilitation of depolarization-evoked Ca2+ accumulation and glutamate release induced by exogenous arachidonate. These facilitory effects may be related to the induction of long-term synaptic potentiation, which is an accepted correlate of learning and memory. In addition, we obtained evidence that presynaptic receptor activation stimulates the synthesis of arachidonate-derived prostaglandins. Thus, the metabolism of arachidonic acid may play a central role in presynaptic plasticity. GRA

N92-28050# California Univ., San Diego. Dept. of Medicine.
NEURAL BASIS OF MOTION PERCEPTION Annual Report, 1 Apr. 1990 - 31 May 1991
V. S. Ramachandran 14 Feb. 1992 8 p
(Grant AF-AFOSR-0414-89)
(AD-A248411; AFOSR-92-0204TR) Avail: NTIS HC/MF A02

Our goal is to understand the neural basis of perception and to test computational models of visual processing. This year we have been pursuing 3 lines of research: (1) we have been continuing our earlier studies on 'motion capture', shape from shading, and stereopsis. Our research suggests that image segmentation (based on texture, occlusion can) profoundly influences the early visual processing of stereopsis, shape from shading, and motion correspondence; (2) we have begun to investigate the 'filling in' of 'artificial scotomas' and of scotomas produced by brain injury (our goal has been to understand surface interpolation); and (3) we have developed a new psychophysical technique for isolating and studying a fast contour system in human vision (a system that might correspond to the magnocellular pathway of physiologists) GRA

N92-28094# Massachusetts Inst. of Tech., Cambridge. Dept. of Brain and Cognitive Sciences.
STRATEGIES TO SUSTAIN AND ENHANCE PERFORMANCE IN STRESSFUL ENVIRONMENTS Annual Technical Report, 15 Dec. 1990 - 14 Dec. 1991
Richard J. Wurtman, Harry J. Lynch, and Andrew B. Dollins 10

Jan. 1992 9 p
(Grant AF-AFOSR-0125-90)
(AD-A247197; AFOSR-92-0141TR) Avail: NTIS HC/MF A02

Three lines of study were outlined in the previous report: (1) to test the efficacy of the catecholamine precursor L-Tyrosine in reducing pilot performance deficits caused by sleep deprivation, (2) to assess the role of endogenous melatonin on various performance and behavioral indices through photic modulation of nocturnal melatonin secretion, and (3) to examine the effects on the same performance and behavioral variables of exogenous melatonin administered during the day. The data have been collected for all three studies, involving 14, 24, and 21 human volunteers respectively, and analysis is in progress. Preliminary analysis of the results are consistent with the hypotheses upon which the studies were predicated and provide a basis for a more fruitful continuation and elaboration of this investigation. GRA

N92-28142# Carnegie-Mellon Univ., Pittsburgh, PA.
THE 24TH CARNEGIE SYMPOSIUM ON COGNITION: THE NEURAL BASIS OF HIGH-LEVEL VISION Final Report
Martha J. Farah Mar. 1992 3 p Symposium held in Pittsburgh, PA, 29-31 May 1991
(AD-A248460) Avail: NTIS HC/MF A01

The 24th Carnegie Symposium on Cognition was held on May 29-31, 1991. The papers presented covered the following topics: perception and object representation; category specificity and object recognition; visual processes in reading; recognition and conscious awareness; and top down processes in vision including attention and imagery. These topics were addressed by speakers from the fields of cognitive psychology, neuropsychology, and neurobiology. GRA

N92-28164# Naval Aerospace Medical Research Lab., Pensacola, FL.
THE INFLUENCE OF SUBJECT EXPECTATION ON VISUAL ACCOMMODATION IN THE DARK
W. B. Cushman Dec. 1991 14 p
(DA Proj. M00-96)
(AD-A245923; NAMRL-1366) Avail: NTIS HC/MF A03

The prospect of a pilots vision at night being reduced to a less than optimal state by night myopia has been debated for years in a large body of research. This report casts doubt on the existence of night myopia in young healthy pilots by presenting evidence that the accommodative reflex may be driven by direct cognitive control inputs. Direct cognitive control, based on an individual's expectation of accommodative range, could bias measures of night myopia if the measuring instruments are placed close to the subject's eyes. Subjects studied for this report demonstrated excellent visual performance in the dark, at a range of 20 ft, despite measured night myopia of up to 7.94 diopters. GRA

N92-28170# California Univ., Berkeley. Dept. of Psychology.
VISUAL PERCEPTION OF FEATURES AND OBJECTS Annual Report, 15 Sep. 1990 - 14 Sep. 1991
Anne M. Treisman 14 Sep. 1991 21 p
(Grant AF-AFOSR-0370-90)
(AD-A248578; AFOSR-92-0265TR) Avail: NTIS HC/MF A03

The research can be divided into work on (1) preattentive visual processing, and (2) work on visual memory and priming for previously perceived objects. Some of the main findings are covered. (1) We showed that parallel, preattentive processing of motion and orientation depends on the elements sharing the same direction of contrast. However, some cues to occlusion appear also to be available preattentively, since they can control the correspondence matching in apparent motion. Preattentive grouping can guide attention in patients with neglect even though the elements are not consciously available. (2) Token representations of two novel objects can apparently be formed in a single trial. Attention then selects one of the two for response and inhibits the other. Its memory trace may nevertheless remain available to prime or interfere with subsequent perception of the same object. Similar priming and interference effects in visual search suggest that practice and automation may also depend on specific memory traces for each display, and that these are affected by the type of perceptual processing required by the search task. GRA

N92-28176# Oregon Univ., Eugene. Dept. of Psychology.
VISUAL PROCESSING IN TEXTURE SEGREGATION Final Report, 1 Sep. 1988 - 30 Sep. 1991
Jacob Beck 17 Dec. 1991 44 p
(Grant AF-AFOSR-0323-88)
(AD-A247173; AFOSR-92-0075TR) Avail: NTIS HC/MF A03

Two types of texture segregation occurs. Preattentive texture segregation has been shown to occur as a result of differences in the outputs of Gabor filters that operate on intensity values and as a result of the grouping of discrete elements through edge alignment and lightness similarity. Texture segregation based on these properties occurs preattentively. A second type of texture segregation appears to depend on attention. Texture segregation based on the 3D interpretation of projected shapes appears to require a focussing of attention. Attention acts to trigger texture segregation. Attention is required to see a 2D figure as three-dimensional. The 3D interpretation is propagated in parallel or rapidly to the other figures in the pattern, and texture segregation occurs in terms of the differences in the perceived orientations off the 3D figures. A necessary condition for texture segregation is the rapid processing of stimulus differences. Texture segregation does not occur if discrimination of the relevant stimulus differences requires sequential attentional processing. GRA

N92-28179# Stanford Univ., CA. School of Education.
INDIVIDUAL DIFFERENCES IN ADAPTIVE PROCESSING IN COMPLEX LEARNING AND COGNITIVE PERFORMANCE Final Report, 1 Sep. 1989 - 30 Apr. 1991
Richard E. Snow, Robert L. Chastain, and Douglas Jackson, III
17 Mar. 1992 23 p
(Grant AF-AFOSR-0517-89)
(AD-A248586; AFOSR-92-0260TR) Avail: NTIS HC/MF A03

Theories of intelligence and learning ability emphasize individual differences in adaptation of information processing during performance on novel, changing tasks, but measures of adaptation have been lacking. This research sought to develop and evaluate such measures in samples of Air Force recruits. Computerized tests of verbal and spatial reasoning and of spatial-perceptual-motor performance were designed to provide scores reflecting raw and residualized differences between performance in homogeneous versus heterogeneous tasks. Reference tests represented conventional ability constructs. A complex learning task based on logic gates in electronics yielded criterion scores. Reliabilities of adaptation indices were moderate, but within acceptable ranges. Low but significant correlations were obtained between some adaptation scores and some learning indices. Apparently, adaptation estimates can make a small but unique contribution to learning prediction. The research suggested further steps toward instrument improvement that seem clearly justifiable on both theoretical and practical grounds. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

For related information see also *16 Space Transportation.*

N92-27350# Naval Postgraduate School, Monterey, CA.
HUMAN-POWERED HELICOPTER: A PROGRAM FOR DESIGN AND CONSTRUCTION M.S. Thesis
Scott A. Bruce Jun. 1991 130 p
(AD-A246821) Avail: NTIS HC/MF A07

The various aspects of helicopter design and human powered aircraft design are studied to present a program to design and build a human powered helicopter (HPH) at the Naval Postgraduate School. The HPH will be designed to meet the requirements for

the AHS-Sikorsky Award. The helicopter design is refined, and the feasibility of construction is assessed. In addition to pursuing a significant historical achievement, the program seeks to enhance the helicopter and composite programs of the Aeronautical Engineering curriculum at the NPS. Benefits to NPS in terms of research topics and as a research aircraft are presented. Potential future uses for ultralow powered aircraft technology are also outlined. GRA

N92-27358# McMaster Univ., Hamilton (Ontario). Dept. of Physical Education.
EVALUATION OF ALTERNATIVE METHODS FOR INCREASING TOLERANCE TO +Gz ACCELERATION, PHASE 3 Final Report
J. D. MacDougall Jun. 1991 44 p
(Contract DCIEM-W7711-9-7091-01-XSE)
(CTN-92-60539) Avail: NTIS HC/MF A03

The effectiveness of anti-G counter maneuver depends upon the extent to which it elevates central arterial blood pressure so that cerebral flow can be maintained during radial headward acceleration (Gz). The effectiveness of various components of the anti-G straining maneuver was evaluated by directly recording arterial blood pressure at different Gz accelerations. The following results were obtained: (1) an indwelling pressure-tip transducer is preferable to an external fluid column-coupled transducer for measurement of blood pressure for human centrifuge experimentation; (2) assuming no reflex vasoconstriction, blood pressure declines directly according to vertical distance above the heart and to the level of the Gz acceleration; (3) an isometric leg contraction protocol which involves brief relaxation phases is no more effective than an uninterrupted isometric contraction over the same duration; (4) when subjects attempt to maintain a maximum contraction of the leg muscles for an extended period of time, the blood pressure reponse is unaffected by the decline in force due to fatigue; (5) the anti-G suit inflation protocol used in the study elevates mean blood pressure by approximately 11 Torr per Gz for gradual onset and 18 Torr per Gz for rapid onset; (6) the increase in blood pressure provided by the standard straining maneuver is caused by both the contraction of the muscles of the lower body and by an increased intrathoric pressure through a respiratory straining maneuver; (7) during Gz acceleration, visual impairement tends to occur when eye-level mean blood pressure falls to approximately 47 Torr; and (8) a critical factor affecting G-induced loss of consciousness is the total accumulated time over which effective brain flow is suspended. CISTI

N92-27372 Department of the Navy, Washington, DC.
PIVOTING SEAT FOR FIGHTER AIRCRAFT Patent
Chi Tung, inventor (to Navy) 12 Nov. 1991 7 p Filed 26 Sep. 1990
(AD-D015244; US-Patent-5,064,146; US-Patent-Appl-SN-589703; US-Patent-Class-244-122) Avail: US Patent and Trademark Office

A high-performance aircraft seat is disclosed that automatically reacts to recline the pilot as the aircraft experience higher G's in the vertical direction, or along the pilot's Z-axis. The seat, consisting of a seat pan joined to a seat back, is hingedly fixed, at a point forward of the pilot/seat combination center of gravity, to the surface. An hydraulic cylinder is fixed between the surface, aft of the hinge point and the seat back, and will react to return the seat to its initial position, from a G-force induced reclining position, whenever the G forces subside. GRA

N92-27664# Defence Research Establishment, Ottawa (Ontario).
DEVELOPMENT OF A STANDARD ANTHROPOMETRIC DIMENSION SET FOR USE IN COMPUTER-AIDED GLOVE DESIGN
David Hidson Oct. 1991 32 p
(AD-A246272; DREO-TN-9122) Avail: NTIS HC/MF A03

Anthropometric variables have always been measured with tapes and calipers and the data gathered have been the source material for designers and patternmakers in the development of NBCW protective equipment. This paper describes the re-assessment of the variables and dimensions under consideration and the construction of a new set of variables, for measuring hands, localized in three dimensional space, that may be measured by traditional techniques but yet be suited to CAD/CAM applications. A set of fifty dimensions was devised and a datum from which to measure was defined. Data were taken from a small sample of hands and a computerized model constructed. Models may be constructed from fewer dimensions but there will be less variability in the resultant surface. GRA

N92-27990# Walter Reed Army Inst. of Research, Washington, DC.
CHARACTERIZATION OF PEAK INSPIRATORY FLOW AND ALVEOLAR VENTILATION DURING MAXIMAL ARM CRANK EXERCISE WITH AND WITHOUT INSPIRATORY AIRFLOW RESISTANCE Final Report, Mar. 1989 - Oct. 1991
Kenneth G. Torrington, Caren K. Euster, and Kenneth T. Dodd 21 Oct. 1991 47 p
(DA Proj. 3M1-61102-BS-15)
(AD-A247298; WRAIR-TR-91-001) Avail: NTIS HC/MF A03

The Army requires an accurate understanding of ventilatory requirements for combat vehicle crewmen. This study was conducted to measure 3 specific ventilatory parameters in exercising soldiers so that (1) Army engineers would be able to optimize design specifications for tank air delivery systems, (2) strategists would be better able to develop doctrine regarding use of the disconnected protective mask apparatus (Mission Oriented Protective Posture Gear), and (3) military planners would be better able to predict carbon monoxide hazards for tank crewmen. The objective of the current protocol was to measure maximal human ventilatory parameters during upper body exercise to extend the application of observations made during a previous field study of tank crewman's requirements. This study will provide measurements of peak inspiratory flow (V sub i peak), estimates of alveolar ventilation (v sub A), and understanding of respiratory muscle fatigue. GRA

N92-27991# Army Aeromedical Research Lab., Fort Rucker, AL.
SOUND ATTENUATION CHARACTERISTICS OF THE DH-133A HELMET Final Report
Ben T. Mozo, Barbara A. Murphy, and Linda S. Barlow Jan. 1992 25 p
(DA Proj. 3M1-62787-A-878)
(AD-A248351; USAARL-92-8) Avail: NTIS HC/MF A03

This report documents the sound attenuation characteristics of a product improvement of the standard DH-132A helmet. Results indicate the improved helmet exceeds the attenuation required by the specification at all test frequencies and is significantly better than the DH-132 at most frequencies. A spring tension band between the earcups, improves earcup-to-head retention. A thermo-plastic liner improves stability and comfort. All of the improvements are available in kit form for field upgrade of fielded DH-132A helmets. GRA

N92-28071# Aerospace Medical Research Labs., Brooks AFB, TX.
ERGONOMICS MANUAL Final Report
Judith A. Holl Oct. 1991 100 p
(AD-A246934; AL-TR-1991-0082) Avail: NTIS HC/MF A05

This report is written to help base-level aerospace medicine services personnel establish a program for identifying and correcting ergonomic deficiencies in workplaces on their bases. It is provided as a starting point for assembling information and learning about ergonomics. A suggested bibliography is included that will help establish reference libraries. This report is not an all-inclusive reference, but highlights major areas of ergonomics. More detailed texts should be used for indepth information. GRA

N92-28157*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
JOHNSON SPACE CENTER'S REGENERATIVE LIFE SUPPORT SYSTEMS TEST BED
Donald L. Henninger, Terry O. Tri, Daniel J. Barta, and Randal S. Stahl 1991 11 p
(NASA-TM-107943; NAS 1.15:107943) Avail: NTIS HC/MF A03

The Regenerative Life Support System (RLSS) Test Bed at NASA's Johnson Space Center is an atmospherically closed, controlled environment facility for the evaluation of regenerative life support systems using higher plants in conjunction with physicochemical life support systems. When completed, the facility will be comprised of two large scale plant growth chambers, each with approximately 10 m(exp 2) growing area. One of the two chambers, the Variable Pressure Growth Chamber (VPGC), will be capable of operating at lower atmospheric pressures to evaluate a range of environments that may be used in Lunar or Martian habitats; the other chamber, the Ambient Pressure Growth Chamber (APGC) will operate at ambient atmospheric pressure. The root zone in each chamber will be configurable for hydroponic or solid state media systems. Research will focus on: (1) in situ resource utilization for CELSS systems, in which simulated lunar soils will be used in selected crop growth studies; (2) integration of biological and physicochemical air and water revitalization systems; (3) effect of atmospheric pressure on system performance; and (4) monitoring and control strategies. Author

N92-28166# Defence Research Establishment, Ottawa (Ontario).
THERMAL RESISTANCE VALUES OF SOME PROTECTIVE CLOTHING ENSEMBLES
Brad Cain Oct. 1991 15 p
(AD-A245937; DREO-TN-91-24) Avail: NTIS HC/MF A03

This report describes methods used to predict the thermal insulation values of thin clothing ensembles and compares the results to those obtained from thermal manikin measurements. In calm conditions, the results compare favorably. In windy conditions, the predicted thermal resistance is greater than the measured value. This is because the theory used does not include wind induced ventilation of the clothing and the accompanying increase in heat transfer. GRA

55 SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing.

For components see *33 Electronics and Electrical Engineering.*

N92-28063# Rome Lab., Griffiss AFB, NY.
VARIABLE HOLD TIME IN DYNAMIC RANDOM ACCESS MEMORIES Report, Sep. 1989 - Jun. 1991
Daniel J. Burns, Wilmar Sifre, and Mark W. Levi Dec. 1991 136 p
(AF Proj. 2338)
(AD-A248602; RL-TR-91-359) Avail: NTIS HC/MF A07

Unstable data retention time has been observed in small populations of bits in certain dynamic random access memory (DRAM) products. This effect has been called variable hold time (VHT), and it represents a potential soft error failure mechanism. This is especially true for devices with poorly controlled refresh time distributions in situations where system refresh time requirements may be aggressive (e.g., at either high temperature where Tref is low, or in a low temperature application which assumes high Tref values). Commonly specified device testing procedures do not determine the distribution of bit refresh times or VHT characteristics, and therefore there is no assurance that VHT soft errors will not occur in use. This report describes testing procedures developed to characterize VHT in DRAMs, and includes test results for a limited number of samples of a few device types. Our test results indicate that generally refresh times are specified conservatively enough, and that VHT instabilities are low enough that no soft errors would be expected in these particular devices. However, at least one device type tested was marginal in this respect, and further study is needed to understand lot-to-lot VHT variations with different manufacturers' materials and processing. GRA

N92-28095# Army Aeromedical Research Lab., Fort Rucker, AL.
COMPARABILITY OF TWO COGNITIVE PERFORMANCE ASSESSMENT SYSTEMS Final Report
Robert L. Stephens and Robert W. Verona Feb. 1992 92 p
(AD-A248760; USAARL-92-16) Avail: NTIS HC/MF A05

This study compared two computerized cognitive performance assessment systems: a typical laboratory desktop computer system and a ruggedized, hand-held field-portable system. Identical cognitive performance assessment software was installed on the two devices in order to determine whether differences in the hardware configurations of the two devices influenced measures of cognitive performance. Data were collected on 24 subjects over a period of 1 week during which subjects performed six cognitive tasks twice a day on each of the computer systems. Results indicated a high degree of sensitivity of the cognitive tests to day and session effects. Also, there were tasks in which the type of device used to present stimuli and record data influenced the results obtained. Differences between the two devices in terms of their display characteristics seem to account for the influences. GRA

N92-28177# Texas A&M Univ., College Station. Dept. of Industrial Engineering.
ADVANCED USER INTERFACE CAPABILITIES FOR APPLICATION ON PORTABLE COMPUTERS Final Technical Report, Jun. 1990 - Jun. 1991
Deborah A. Mitta Feb. 1992 50 p
(Contract F33615-87-D-0627)
(AD-A247295; AL-TP-1992-0002) Avail: NTIS HC/MF A03

This paper describes research conducted to examine the feasibility of using the fisheye concept to present complex diagrams and illustrations for use by Air Force maintenance personnel. Under the fisheye concept, the user is able to select for viewing those portions of graphics or subgraphics in which he is most interested. These items are presented in more detail while surrounding items

of less interest are presented in less detail. The research demonstrated that the fisheye concept can be applied to present technical data for use in Air Force maintenance. However, it was noted that further study is needed to evaluate the relative effectiveness of the fisheye approach and other information presentation techniques to support maintenance activities. GRA

N92-27266*# Utah State Univ., Logan. Coll. of Science.
THE INTERSTELLAR GAS EXPERIMENT: ANALYSIS IN PROGRESS Abstract Only
F. Buehler, D. L. Lind, J. Geiss, and O. Eugster *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 55 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27776*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
END-EFFECTOR MICROPROCESSOR
William R. Doggett *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 179-186 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

N92-27832*# Old Dominion Univ., Norfolk, VA. Dept. of Computer Science.
APPLICATION DRIVEN INTERFACE GENERATION FOR EASIE M.S. Thesis
Ya-Chen Kao *In its* Geometric Modeling for Computer Aided Design Jun. 1992 22 p (For primary document see N92-27829 18-61)
Avail: NTIS HC/MF A07

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, alogorithms, and specific applications, e.g., CAD/CAM.

N92-27208# David Taylor Research Center, Bethesda, MD. Systems Dept.
THE EPSA TO PATRAN INTERFACE
Robert R. Lipman Jan. 1992 11 p
(AD-A246489; DTRC/SD-92/09) Avail: NTIS HC/MF A03

This report describes the development and use of two computer programs that (1) translate an EPSA input file into a PATRAN neutral file, and (2) translate EPSA global output request files into PATRAN results files. Sample PATRAN sessions for reading in the PATRAN neutral file and for displaying EPSA analysis results are shown. GRA

N92-27211# Illinois Univ., Urbana. Center for Reliable and High-Performance Computing.
COMPILER-ASSISTED STATIC CHECKPOINT INSERTION
Junsheng Long, W. K. Fuchs, and Jacob A. Abraham 1991 20 p
(Contract N00014-91-J-1283)
(AD-A246496) Avail: NTIS HC/MF A03

This paper describes a compiler assisted approach for static checkpoint insertion. Instead of fixing the checkpoint location before program execution, a compiler enhanced polling mechanism is utilized to maintain both the desired checkpoint intervals and reproducible checkpoint locations. The technique has been implemented in a GNU CC compiler for Sun 3 and Sun 4 (Sparc) processors. Experiments demonstrate that the approach provides for stable checkpoint intervals and reproducible checkpoint placements with performance overhead comparable to a previously presented compiler assisted dynamic scheme (CATCH) utilizing the system clock. GRA

N92-27215# Naval Postgraduate School, Monterey, CA.
ALTERNATIVES FOR DEVELOPING USER DOCUMENTATION FOR APPLICATIONS SOFTWARE M.S. Thesis
Nancy K. Clark Sep. 1991 131 p
(AD-A247248) Avail: NTIS HC/MF A07

The preparation of software documentation is an iterative process that involves research, analysis, design, and testing. The writer must have a solid understanding of the technical aspects of the document being prepared, good writing skills, and, most important, an understanding of the needs of the audience for whom the document is written. This thesis describes the theory and steps taken in developing software user documentation for applications software. The final products are two prototypes of user's guides for applications software programs, specifically WordPerfect 5.1 and dBase IV 1.1, installed on the networks in the Administrative Sciences/Information Systems Computer Laboratories at the Naval Postgraduate School. GRA

N92-27333# Naval Postgraduate School, Monterey, CA.
ENHANCEMENT OF IMAGE PROCESSING CAPABILITIES FOR DIFFERENT ENVIRONMENTS M.S. Thesis
Erkan Aykac Jun. 1991 49 p
(AD-A246956) Avail: NTIS HC/MF A03

This thesis provides a set of tools for the enhancement of digital image processing capabilities on MS-DOS, UNIX, VM operating systems with computer programming languages APL, C, FORTRAN, and MATLAB. The tools consist of input/output functions for images on SUN SPARC-stations and IBM-PC compatibles and finally a toolkit for MATLAB to implement the basic digital image processing functions. GRA

N92-27367# Lawrence Livermore National Lab., CA.
USING ELROS TO IMPLEMENT ISO APPLICATION PROTOCOLS
M. L. Branstetter, J. A. Guse, and D. M. Nessett 30 Oct. 1991 128 p
(Contract W-7405-eng-48)
(DE92-010446; UCRL-MA-108542) Avail: NTIS HC/MF A07

Developing distributed applications is a sometimes onerous chore rarely made easier by good programming tools. ELROS is an attempt to improve this situation, at least with respect to writing distributed application code. ELROS stands for Embedded Language for Remote Operations Service. Remote Operations Service is a generalization of remote procedure call (RPC), being different by virtue of its potential asynchronicity. The model and protocol associated with remote operations are ISO standards (ISO 9072-1 and 9072-2), which uses the services of other ISO standard protocols, including Abstract Syntax Notation 1, abbreviated ASN.1, (ISO 8824), and the ISO presentation-layer protocol (ISO 8822 and 8823). ELROS provides specification and runtime interfaces to control certain aspects of each of these protocols. The designers of ELROS intend it to be used for a variety of purposes. The main goal is to provide a convenient programming language for writing distributed scientific applications. This affected the design mainly by motivating certain language primitives, such as the call statement, elidable parameters, and the runtime specification of the length of arrays that are operation parameters. A second goal was to support the writing of programs that implement ISO application layer protocols. An ELROS primer is available that explains the use of ELROS in writing distributed scientific applications. The purpose of this tutorial is to explain the features of ELROS that are useful in writing implementations of ISO application protocols. DOE

N92-27382# Naval Oceanographic and Atmospheric Research Lab., Bay Saint Louis, MS.
CURVE FITTING USING GENETIC ALGORITHMS Final Report
K. Messa and M. Lybanon Oct. 1991 23 p
(AD-A247206; AD-E040219; NOARL-18) Avail: NTIS HC/MF A03

Genetic algorithms are search techniques based on the mechanics of natural selection. They have been used successfully in many applications because of their robustness and because of

their ability to search in a noisy problem space. In particular, genetic algorithms are used in curve-fitting. The genetic algorithm selects the coefficients of a particular curve that most closely matches a given set of data. Candidate solutions are vectors of real numbers that represent the coefficients of the curve to be modeled. Thus, every candidate solution corresponds to a new function. As such, each candidate solution is evaluated using the sum of the squares of the residuals. The evaluation of each of these curves with respect to its fit of the data guides the genetic algorithm toward the solution with the greatest merit. Several examples of the application of genetic algorithms to curve-fitting problems are presented. Convergence to the optimal solution is rapid when knowledge of the coefficients is available. When little is known about coefficients, a degree of experimentation help obtain the optimal solution. GRA

N92-27387# Naval Postgraduate School, Monterey, CA.
DATA COMPRESSION AND ARCHIVING SOFTWARE IMPLEMENTATION AND THEIR ALGORITHM COMPARISON M.S. Thesis
Young J. Jung Mar. 1992 94 p
(AD-A247853) Avail: NTIS HC/MF A05

Although data compression has been studied for over 30 years, many new techniques are still evolving. There is considerable software available that incorporates compression schemes and archiving techniques. The U.S. Navy is interested in knowing the performance of this software. This thesis studies and compares the software. The testing files consist of the file types specified by the U.S. Naval Security Detachment at Pensacola, Florida. GRA

N92-27391# Lawrence Livermore National Lab., CA.
THE MULTICOMPUTER TOOLBOX APPROACH TO CONCURRENT BLAS AND LACS
R. Falgout, A. Skjellum, S. Smith, and C. Still 29 Feb. 1992 16 p Presented at the Scalable High Performance Computing Conference, Williamsburg, VA, 6-29 Apr. 1992
(Contract W-7405-eng-48)
(DE92-010401; UCRL-JC-109775; CONF-9204106-1) Avail: NTIS HC/MF A03

We describe many of the issues involved in general-purpose Concurrent Basic Linear Algebra Subprograms (Concurrent BLAS or CBLAS). Additionally, we discuss data-distribution independence, while further generalizing data distributions. We comment on the utility of Linear Algebra Communication Subprograms (LACS). We describe an algorithm for dense matrix-matrix multiplication and also discuss matrix-vector multiplication issues. With regard to communication, we conclude that there is limited leverage in LACS per se as a stand-alone message-passing standard, and propose that needed capabilities instead be integrated in general, application-level message passing standard, focusing attention on CBLAS and large-scale application needs. Most of the proposed LACS features are similar to existing or needed general-purpose primitives anyway. All of the ideas discussed here were implemented or, as noted, are under current development within the Multicomputer Toolbox open software system. DOE

N92-27414# Stanford Linear Accelerator Center, CA.
HIPPODRAW AND HIPPOPLOTAMUS
M. F. Gravina, P. F. Kunz, T. J. Pavel, and P. E. Rensing Feb. 1992 5 p Presented at the 2nd International Workshop on Software Engineering, Artificial Intelligence, and Neural Nets for High Energy and Nuclear Physics, L'Agelonde, France, 13-18 Jan. 1992
(Contract DE-AC03-76SF-00515)
(DE92-010744; SU-SLAC-PUB-5758; CONF-920172-5) Avail: NTIS HC/MF A01

Hippo Draw is a result of research into finding better ways to visualize the kind of statistical data that is so common in high energy physics analyses. In these analyses, frequency distributions are visualized as histograms, contour plots, and scatter plots. Traditionally, one used a library of subroutines, called a histogram package, within one's analysis programs to create and display such distributions. HippoDraw is a NeXTstep application for viewing statistical data. It has several unique features which make viewing data distributions highly interactive. It also incorporates simple drawing tools. HippoDraw is written in Objective-C and uses the Hippoplotamus library package which handles the n-tuples and displays. Hippoplotamus is written in ANSI C. DOE

N92-27436# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
USING Ada BINDINGS TO THE X WINDOW SYSTEM
Gary W. Klabunde and Mark A. Roth 30 Dec. 1991 12 p
(AD-A245366; AFIT/EN-TR-91-10) Avail: NTIS HC/MF A03

The graphical user interface was accepted as being one of the most important parts of the user interactive software projects. Until recently, however, the design and implementation of such interfaces in Ada was a long and difficult process. A solution to this problem was found with the introduction of the X Window System in the mid 1980's. These C libraries make it relatively easy to construct sophisticated user interfaces. In the last couple of years, several organizations have developed bindings to, or implementation of, the X Window System software for use in Ada programs. Two of the more significant accomplishments were the bindings developed by the Science Applications International Corporation (SAIC) and those developed by the Boeing Aerospace Corporation. In 1987, SAIC developed Ada bindings to X11R4. Their work was performed under a Software Technology for Adaptable Reliable Systems (STARS) foundation contract, and is therefore in the public domain. In this paper we present a detailed example of how to use the SAIC and Boeing bindings to interface an Ada program to X. We discuss issues involving SAIC/Boeing binding compatibility, pixmap creation and use, connection with the X-server, creation of several different widgets, and adding appropriate callback procedures. We give a more general description of the issues involved in building Ada/X interfaces. GRA

N92-27504# Naval Postgraduate School, Monterey, CA.
NPSNET: PHYSICALLY-BASED MODELING ENHANCEMENTS TO AN OBJECT FILE FORMAT M.S. Thesis
James G. Monahan Sep. 1991 71 p
(AD-A246594) Avail: NTIS HC/MF A04

The Naval Postgraduate School (NPS) has actively explored the design and implementation of real time three dimensional simulators on low-cost, readily accessible graphics workstations. Many of the simulator platforms have had tremendous success due to the fact that a common object format was used. Prototyping time is dramatically reduced when the tedious and often repetitious task of object design is replaced with the simpler task of modifying an existing object description file. The current level of support that the NPS Object File Format (OFF) provides is descriptions for lights, lighting, material characteristics, the expected graphics drawing primitives, and provisions for texturing and special lighting effects. The objectives of this research are the enhancement of the basic OFF structure with information necessary for accurate physically-based rendering in real-time; to construct a library of functions specifying an object's physical properties and the internal/external forces controlling the object; and to develop a tool to rapidly design and test an object's dynamic characteristics. GRA

N92-27522# Naval Postgraduate School, Monterey, CA.
REUSABLE SOFTWARE COMPONENT RETRIEVAL VIA NORMALIZED ALGEBRAIC SPECIFICATIONS Ph.D. Thesis
Robert A. Steigerwald Dec. 1991 237 p
(AD-A246002) Avail: NTIS HC/MF A11

Efforts in the software engineering community to reuse code are hampered by a lack of tools. Reusability is particularly beneficial in a rapid prototyping environment. Rapid prototyping with automated reusable software component retrieval is a software development method to rapidly construct and adapt software, validate and refine requirements, and check the consistency of proposed designs. This dissertation describes a tool used within the Computer Aided Prototyping System (CAPS), developed at

the Naval Postgraduate School, which retrieves reusable components from a software base using a formal specification as the search key. The query specification that represents a design requirement is compared to formal specifications of Ada reusable software components stored in an object-oriented database management system. A syntactic search compares specification interfaces, identifying reusable candidates based on types of parameters. The semantic search rank orders a set of candidate components based on semantic similarity to the query. The method, called query by consistency, compares terms that are reduced in the axioms of each specification. Specifications are normalized to facilitate the matching between query specifications and reusable component specifications in the retrieval. A formal proof verifies that query by consistency can retrieve components guaranteed to meet specified requirements. GRA

N92-27524# Naval Postgraduate School, Monterey, CA.
A REUSABLE COMPONENT RETRIEVAL SYSTEM FOR PROTOTYPING M.S. Thesis
John K. McDowell Sep. 1991 339 p
(AD-A246081) Avail: NTIS HC/MF A15

Prototyping is an important software development method to rapidly construct software, validate and refine requirements, and check the consistency of proposed software designs. This thesis describes the design and implementation of a CASE tool to be used in conjunction with the Computer Aided Prototyping System (CAPS) which retrieves and prepares reusable components for use in PSDL (Prototype System Description Language) prototypes. Reusable components and their PSDL specifications are stored in a software base. Components can be retrieved from the software base via its Object-Oriented Data Base Management System (OODBMS) by using PSDL to formulate queries. All of the PSDL specifications for the reusable components are normalized and stored in the software base to support efficient searches based on a given query PSDL specification for a software component. The search process is based on both syntactic and semantic matches between the query and stored components. Our software base was designed to be easily configured to support storage and retrieval of reusable components in any programming language with the initial configuration for Ada components. A window based user interface was also implemented to allow easy access to the software base via the CAPS user interface as well as stand alone use. GRA

N92-27544# Naval Postgraduate School, Monterey, CA.
A MICRO COMPUTER BASED PROCUREMENT SYSTEM: AN APPLICATION OF REVERSE ENGINEERING TECHNIQUES M.S. Thesis
George T. Skrtich and Daniel E. Delaney Mar. 1991 123 p
(AD-A245956) Avail: NTIS HC/MF A06

The Department of the Navy has developed a system called the Automation of Procurement and Accounting Data Entry (APADE), which automates the procurement of nonstandard materials. Small Navy Field contracting locations, however, cannot afford to utilize this service, and the Navy currently has no standard microcomputer software for such procurement. This thesis analyzes and reviews the Navy's APADE procurement system using a reverse engineering approach. It establishes an entity relationship model from the existing APADE flat files. This entity relationship model is then used to design and implement a prototype of the APADE system small procurement module on micro computers. The prototype microcomputer version emulates the small procurement functions of the mainframe system. GRA

N92-27560*# Dartmouth Coll., Hanover, NH. Dept. of Mathematics and Computer Science.
IMPLEMENTATION NOTES ON bdes(1)
Matt Bishop 1991 12 p
(Grant NAG2-680)
(NASA-CR-190442; NAS 1.26:190442; PCS-TR91-158) Avail: NTIS HC/MF A03

This note describes the implementation of bdes, the file encryption program being distributed in the 4.4 release of the Berkeley Software Distribution. It implements all modes of the Data Encryption Standard program. Author

N92-27561*# Dartmouth Coll., Hanover, NH. Dept. of Mathematics and Computer Science.
APPLYING THE TAKE-GRANT PROTECTION MODEL
Matt Bishop 1990 28 p
(Grant NAG2-268)
(NASA-CR-190439; NAS 1.26:190439; PCS-TR90-151) Avail: NTIS HC/MF A03

The Take-Grant Protection Model has in the past been used to model multilevel security hierarchies and simple protection systems. The models are extended to include theft of rights and sharing information, and additional security policies are examined. The analysis suggests that in some cases the basic rules of the Take-Grant Protection Model should be augmented to represent the policy properly; when appropriate, such modifications are made and their efforts with respect to the policy and its Take-Grant representation are discussed. Author

N92-27569# Naval Postgraduate School, Monterey, CA.
AN EMPIRICAL STUDY OF FAULT DETECTION BY STATIC UNITS-CONSISTENCY ANALYSIS M.S. Thesis
Judy A. Browning 18 Sep. 1991 91 p
(AD-A247592) Avail: NTIS HC/MF A05

With the increasing costs involved in software development, testing has become a more critical aspect of the software engineering process. Automatic methods, such as various static analysis techniques, may offer economic fault detection. This thesis analyzes a static analysis technique that allows users to associate units with variables in computer programs and to check that data transformations manipulate units in a consistent manner. A tool is designed and applied for this analysis. Its performance is measured by comparing the results with a previous study of other testing techniques in detecting faults. The results reveal that this technique consistently detected a narrow class of faults including some faults not found by other testing techniques. The results also show that application of this technique during the requirements and design phases of software development can identify faults associated with units-inconsistency early and reduce costs involved in developing a software test. GRA

N92-27570# Oak Ridge National Lab., TN.
AN INTRODUCTION TO COMPUTER VIRUSES
D. R. Brown Mar. 1992 39 p
(Contract DE-AC05-84OR-21400)
(DE92-010727; ORNL/CSD/TM-281) Avail: NTIS HC/MF A03

This thesis contains an overview of the computer virus arena that can help the reader to evaluate the threat that computer viruses pose. The extent of this threat can only be determined by evaluating many different factors. These factors include the relative ease with which a computer virus can be written, the motivation involved in writing a computer virus, the damage and overhead incurred by infected systems, and the legal implications of computer viruses. Based upon the research, the development of a computer virus seems to require persistence more than technical expertise. This is a frightening proclamation to the computing community. The education of computer professionals to the dangers that viruses pose to the welfare of the computing industry as a whole is stressed as a means of inhibiting the current proliferation of computer virus programs. Recommendations are made to assist computer users in preventing infection by computer viruses. These recommendations support solid general computer security practices as a means of combating computer viruses. DOE

N92-27576# Naval Postgraduate School, Monterey, CA.
COMPUTER SOFTWARE PROJECT MANAGEMENT: AN INTRODUCTION M.S. Thesis
Samuel M. Liberto Jun. 1991 117 p
(AD-A246147) Avail: NTIS HC/MF A06

This thesis addresses the general principles of computer software project management. The main objective is to aid

perspective software project managers in dealing with the development and management of software projects. The definition of the classical software development life cycle is given. The components include system engineering, analysis, design, coding, testing, and maintenance. The thesis contains a description of the reasons why many software projects have cost overruns and late schedules. The variability of requirements and software complexity are two factors. Proper project management is one remedy to project cost overruns and late schedules. The components of software project management are planning, organizing, directing, and controlling. Many tables of comparisons and techniques for aiding software project management are given. State of the art software development techniques are discussed. Finally, a checklist to aid software managers when developing software is provided. GRA

N92-27584# Spectra Research Systems, Inc., Huntsville, AL.
COMPUTER GRAPHICS FOR BEARING DYNAMIC ANALYSIS Final Report, 7 Apr. - 11 Nov. 1991
James D. Moore and Doug A. Clemons 30 Dec. 1991 40 p
(Contract F33615-91-C-2133)
(AD-A247567; WL-TR-91-2128) Avail: NTIS HC/MF A03

The enormous amount of data produced by computer codes used by the aerospace industry to design and evaluate high speed rolling element bearings makes it difficult and time consuming to synthesize and evaluate analysis results. The objective of this research effort was to determine if computer graphics and animation techniques can be used to develop software tools for postprocessing dynamic analysis results and presenting the results in a clear concise graphical format. The software developed uses the output from a bearing dynamic modeling code to create an animation of the bearing such that the interactions of the bearing components can be viewed. During this study, a graphical postprocessor was developed that uses results from dynamic analysis to animate an operating ball bearing as viewed from an axial prospective. The software also includes various informational displays to present different types of bearing performance data in addition to bearing animation. The races and cages were displayed in two-dimensional graphics and the rolling elements were displayed in three-dimensional graphics. The software was used to review several bearing analysis data sets and it was found that use of the animation software improved comprehension of the analysis results and promoted better understanding of the kinetic phenomena occurring in the bearing. GRA

N92-27585*# Research Inst. for Computing and Information Systems, Houston, TX.
MEASURING UNCERTAINTY BY EXTRACTING FUZZY RULES USING ROUGH SETS AND EXTRACTING FUZZY RULES UNDER UNCERTAINTY AND MEASURING DEFINABILITY USING ROUGH SETS Interim Draft Report
Jeffrey A. Worm and Donald E. Culas (Houston Univ., Clear Lake, TX.) Nov. 1991 80 p
(Contract NCC9-16; RICIS Proj. SR-01)
(NASA-CR-190394; NAS 1.26:190394) Avail: NTIS HC/MF A05

Computers are not designed to handle terms where uncertainty is present. To deal with uncertainty, techniques other than classical logic must be developed. This paper examines the concepts of statistical analysis, the Dempster-Shafer theory, rough set theory, and fuzzy set theory to solve this problem. The fundamentals of these theories are combined to provide the possible optimal solution. By incorporating principles from these theories, a decision-making process may be simulated by extracting two sets of fuzzy rules: certain rules and possible rules. From these rules a corresponding measure of how much we believe these rules is constructed. From this, the idea of how much a fuzzy diagnosis is definable in terms of its fuzzy attributes is studied. Author

N92-27591# Rochester Univ., NY. Dept. of Computer Science.
SCOPE AMBIGUITY AND INFERENCE
Massimo Poesio Jul. 1991 48 p
(AD-A247448; TR-389) Avail: NTIS HC/MF A03

Relational semantics can be used to give a denotation to the non-disambiguated logical forms used by natural language processing systems, representations in which the quantifiers are left in situ. Giving a semantics to these logical forms makes it unnecessary for the system to compute all the disambiguated interpretations of a sentence before storing its representation in the knowledge base. Rules of inference can be defined so that the disambiguation process can be formally modeled in a declarative way. 'Weaker' rules of inference can also be specified so that conclusions can be derived from the non-disambiguated representation. GRA

N92-27606# Army Missile Command, Redstone Arsenal, AL. Software Engineering Directorate.
SOFTWARE METRICS FOR TOTAL DEVELOPMENT CYCLE EVALUATION Interim Technical Report, Nov. 1989 - Apr. 1991
Ross Grable Nov. 1991 37 p
(AD-A246477; AD-E951749; AMSMI/TR-RD-BA-91-1) Avail: NTIS HC/MF A03

There are many metrics for gauging software during the several phases of development, but each leaves questions about the quality and maintainability of the software. A new metric is proposed which may overcome some of these problems while giving a strong intuitive model for gauging development progress through design, coding, and testing. A proposal is made for the collection of data for testing and evaluation of this model. GRA

N92-27626*# Dartmouth Coll., Hanover, NH. Dept. of Mathematics and Computer Science.
A PROACTIVE PASSWORD CHECKER
Matt Bishop Jun. 1990 16 p
(Grant NAG2-268)
(NASA-CR-190438; NAS 1.26:190438; PCS-TR90-152) Avail: NTIS HC/MF A03

Password selection has long been a difficult issue; traditionally, passwords are either assigned by the computer or chosen by the user. When the computer does the assignment, the passwords are often hard to remember; when the user makes the selection, the passwords are often easy to guess. This paper describes a technique, and a mechanism, to allow users to select passwords which to them are easy to remember but to others would be very difficult to guess. The technique is site, user, and group compatible, and allows rapid changing of constraints imposed upon the password. Although experience with this technique is limited, it appears to have much promise. Author

N92-27661# Washington Univ., Seattle. Dept. of Statistics.
ASYMPTOTIC PROPERTIES OF A STOCHASTIC EM ALGORITHM FOR ESTIMATING MIXING PROPORTIONS Technical Report, period ending 1 Oct. 1990
Jean Diebolt and Gilles Celeux Oct. 1991 49 p
(Contract N00014-91-J-1074)
(AD-A246263; TR-228) Avail: NTIS HC/MF A03

The purpose of this paper is to study the asymptotic behavior of the Stochastic EM algorithm (SEM) in a simple particular case within the mixture context. We consider the estimation of the mixing proportion p of a two-component mixture of densities assumed to be known. We establish that the stationary distribution of the ergodic Markov chain generated by SEM is asymptotic, as the sample size N tends to infinity, to a Gaussian distribution with mean the consistent maximum likelihood estimate of p and variance proportional to N(sup -0.5). Similarly, we determine the limiting distributions of two sequential versions of SEM and study their asymptotic relative efficiency. GRA

N92-27663# Defence Research Establishment, Ottawa (Ontario).
DESIGN OF DIGITAL SIGNAL PROCESSING ALGORITHMS FOR ENHANCING THE MEASUREMENTS OF ULTRA-FAST ELECTROMAGNETIC TRANSIENTS
Marc Dion Dec. 1991 41 p
(AD-A246269; DREO-1095) Avail: NTIS HC/MF A03

This report describes the various techniques and algorithms developed to enhance the accuracy of the measurements of very

fast transient electromagnetic fields generated during electromagnetic pulse (EMP) testing. Some fundamentals of digital signal processing are presented and the practical aspects are highlighted. The response of some sensors to incident fields is studied. Appropriate algorithms for reconstructing the incident field from the measurements are developed. The effect of low frequency cut-off of some sensors is also studied. A method to design a digital filter to arbitrary transfer function is presented. It is applied to compensate for losses occurring in long cables and also to fine tune other filters. The Hilbert transform is introduced to relate the magnitude and phase component of a transfer function. An implementation of the transform is given, allowing the design of digital filters when only the magnitude of the transfer function is known. GRA

N92-27697# Defence Research Establishment Atlantic, Dartmouth (Nova Scotia). Hydronautics Section.
BLADE: A PROPELLER BLADE GEOMETRY GENERATOR PROGRAM USER'S MANUAL
D. R. Smith and T. R. MacFarlane Feb. 1991 224 p
(DREA-91-302; CTN-92-60453) Avail: NTIS HC/MF A10

BLADE is an interactive computer program developed for generating, drawing, and tabulating propeller blade geometry. The program is composed of four subprograms which accept the basic geometric data, convert the data into 3-dimensional spatial coordinates, provide a graphics capability for verifying the basic 3-dimensional geometry, and produce conventional propeller blade drawings. The program allows editing of the basic geometric data file at any stage of data entry. Two options are provided to create a finite element model of the blade, one creating a session file for the finite element modelling program PATRAN2 and one producing a data file for use by the PVAST3 finite element modelling program. The PATRAN2 model can then be translated to a form suitable for analysis of strength and vibration by the finite element analysis program VAST. Analytical models of the blade, and the blade plus hub or palm, can be generated from the PVAST3 data. The organization of the BLADE program is described and the data input defined. Tabular data and graphics output are illustrated and the method for generating a PATRAN file is demonstrated. Examples of terminal sessions are provided for reference. Author (CISTI)

N92-27718# Naval Postgraduate School, Monterey, CA.
DATA COMPRESSION USING ARTIFICIAL NEURAL NETWORKS
Bruce E. Watkins Sep. 1991 93 p
(AD-A246906) Avail: NTIS HC/MF A05

The application of artificial neural networks to the compression of image data is investigated. An algorithm is developed using the competitive learning paradigm which takes advantage of the parallel processing and classification capability of neural networks to produce an efficient implementation of vector quantization. Multi-Stage, tree searched, and classification vector quantization codebook designs are adapted to the neural network design to reduce the computational cost and hardware requirements. The results show that the new algorithm provides a substantial reduction in computational costs and an improvement in performance. GRA

N92-27829*# Old Dominion Univ., Norfolk, VA. Dept. of Computer Science.
GEOMETRIC MODELING FOR COMPUTER AIDED DESIGN
Progress Report, period ending 31 Mar. 1992
James L. Schwing Jun. 1992 136 p
(Contract NCC1-99)
(NASA-CR-190363; NAS 1.26:190363) Avail: NTIS HC/MF A07

The goal was the design and implementation of software to be used in the conceptual design of aerospace vehicles. Several packages and design studies were completed, including two software tools currently used in the conceptual level design of aerospace vehicles. These tools are the Solid Modeling Aerospace Research Tool (SMART) and the Environment for Software Integration and Execution (EASIE). SMART provides conceptual designers with a rapid prototyping capability and additionally provides initial mass property analysis. EASIE provides a set of interactive utilities that simplify the task of building and executing computer aided design systems consisting of diverse, stand alone analysis codes that result in the streamlining of the exchange of data between programs, reducing errors and improving efficiency. For individual titles, see N92-27830 through N92-27833.

N92-27830*# Old Dominion Univ., Norfolk, VA.
SYSTEM REQUIREMENTS SPECIFICATION FOR SMART STRUCTURES MODE
In its Geometric Modeling for Computer Aided Design Jun. 1992 38 p (For primary document see N92-27829 18-61)
Avail: NTIS HC/MF A07

Specified here are the functional and informational requirements for software modules which address the geometric and data modeling needs of the aerospace structural engineer. The modules are to be included as part of the Solid Modeling Aerospace Research Tool (SMART) package developed for the Vehicle Analysis Branch (VAB) at the NASA Langley Research Center (LaRC). The purpose is to precisely state what the SMART Structures modules will do, without consideration of how it will be done. Each requirement is numbered for reference in development and testing. Author

N92-27831*# Old Dominion Univ., Norfolk, VA.
SURFACE GENERATION AND EDITING OPERATIONS APPLIED TO STRUCTURAL SUPPORT OF AEROSPACE VEHICLE FUSELAGES M.S. Thesis
Susan K. Schwartz *In its* Geometric Modeling for Computer Aided Design Jun. 1992 41 p (For primary document see N92-27829 18-61)
(Contract NCC1-99)
Avail: NTIS HC/MF A07

The Solid Modeling Aerospace Research Tool (SMART) is a computer aided design tool used in aerospace vehicle design. Modeling of structural components using SMART includes the representation of the transverse or cross-wise elements of a vehicle's fuselage, ringframes, and bulkheads. Ringframes are placed along a vehicle's fuselage to provide structural support and maintain the shape of the fuselage. Bulkheads are also used to maintain shape, but are placed at locations where substantial structural support is required. Given a Bezier curve representation of a cross sectional cut through a vehicle's fuselage and/or an internal tank, this project produces a first-guess Bezier patch representation of a ringframe or bulkhead at the cross-sectional position. The grid produced is later used in the structural analysis of the vehicle. The graphical display of the generated patches allows the user to edit patch control points in real time. Constraints considered in the patch generation include maintaining 'square-like' patches and placement of longitudinal, or lengthwise along the fuselage, structural elements called longerons. Author

N92-27832*# Old Dominion Univ., Norfolk, VA. Dept. of Computer Science.
APPLICATION DRIVEN INTERFACE GENERATION FOR EASIE M.S. Thesis **c60**
Ya-Chen Kao *In its* Geometric Modeling for Computer Aided Design Jun. 1992 22 p (For primary document see N92-27829 18-61)
Avail: NTIS HC/MF A07

The Environment for Application Software Integration and Execution (EASIE) provides a user interface and a set of utility programs which support the rapid integration and execution of analysis programs about a central relational database. EASIE provides users with two basic modes of execution. One of them is a menu-driven execution mode, called Application-Driven Execution (ADE), which provides sufficient guidance to review data, select a menu action item, and execute an application program. The other mode of execution, called Complete Control Execution (CCE), provides an extended executive interface which allows in-depth control of the design process. Currently, the EASIE system is based on alphanumeric techniques only. It is the purpose of

this project to extend the flexibility of the EASIE system in the ADE mode by implementing it in a window system. Secondly, a set of utilities will be developed to assist the experienced engineer in the generation of an ADE application. Author

N92-27833*# Old Dominion Univ., Norfolk, VA. Dept. of Computer Science.
GENERATING THE COMPLETE CONTROL ENVIRONMENT INTERFACE FOR EASIE M.S. Thesis
Chia-Lin Tsai *In its* Geometric Modeling for Computer Aided Design Jun. 1992 27 p (For primary document see N92-27829 18-61)
Avail: NTIS HC/MF A07

The Environment for Application Software Integration and Execution (EASIE) was designed to meet the needs of conceptual design engineers that face the task of integrating the results of many stand alone engineering analysis programs. EASIE is a set of utility programs which supports rapid integration and execution of programs about a central relational database, and it provides users with two basic modes of executing operations: Application Derived Executive (ADE), a menu-driven execution mode which provides users with sufficient guidance to quickly review data, select menu action items, and execute application programs, and Complete Control Executive (CCE), which provides a full executive interface, allowing users in-depth control of the design process. Users can switch between these modes as needed. This project will consider the CCE mode interface. Two objectives of this project are to redesign the selecting menus by using a windowing system and to reorganize the selecting structures of the selecting menus. The project will be implemented in the C window system, OSF/Motif version. Author

N92-27848# Naval Postgraduate School, Monterey, CA.
DESIGNING A GRAPHICAL USER INTERFACE FOR A BILATERAL NEGOTIATION SUPPORT SYSTEM M.S. Thesis
Ralph Sabene Mar. 1992 75 p
(AD-A247910) Avail: NTIS HC/MF A04

Graphical User Interfaces (GUI) are quickly becoming the standard operating environment for most software programs and operating systems. Ease of use, rapid learning, and the ability to retain complex task sequences and operations are some of the advantages attributed to this type of interface. When properly implemented the GUI can provide a natural interaction between the user and the computer. Initial acceptance and continued use of any program can be greatly enhanced by proper design of this interface. It is expected that this trend toward visual representation of a task's objects and actions will be more fully developed and expanded in future years. This thesis explored the principles of interface design with particular attention given to the specific characteristics associated with GUI design. Unique design concepts associated with Negotiation Support Systems were also considered. These design techniques and principles were then applied in the analysis and design of the graphical user interface for a Bilateral Negotiation Support System based on multiple attribute utility theory. The program was written in Microsoft Visual Basic for use under the Microsoft Windows 3.0 operating environment. GRA

N92-27868# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
DISTRIBUTED RAY CASTING FOR HIGH-SPEED VOLUME RENDERING M.S. Thesis
Patricia L. Brightbill Jan. 1992 61 p
(AD-A248167; AFIT/GCS/ENG/92M-01) Avail: NTIS HC/MF A04

The volume rendering technique known as ray casting or ray tracing is notoriously slow for large volume sizes, yet provides superior images. A technique is needed to accelerate ray tracing volumes without depending on special purpose or parallel computers. The realization and improvements in distributed computing over the past two decades has motivated its use in this work. This thesis explores a technique to speedup ray casting by distributed programming. The work investigates the possibility of dividing the volume among general purpose workstations and casting rays (using Levoy's front-to-back algorithm) through each subvolume independently. The final step being the composition of all subvolume rendered images. Results indicate a 75 percent savings in rendering time by distributed processing over eight processors versus a single processor. GRA

N92-27919# Boeing Co., Seattle, WA. Defense and Space Group.
UT40 STARS REUSE CONCEPT. VOLUME 1: CONCEPTUAL FRAMEWORK FOR REUSE PROCESS VERSION 1.0
12 Feb. 1992 64 p Prepared in cooperation with IBM Federal Systems Center, Gaithersburg, MD; and Paramax Systems Corp., Reston VA
(Contract F19628-88-D-0031)
(AD-A247267; STARS-TC-04040/001/00) Avail: NTIS HC/MF A04

The purpose of this document is to articulate STARS concepts and expectations for reuse in the context of system development. The concepts described in this document are intended to be generic with respect to their application within specific organizations, relative to specific methodologies or approaches, or as supported by a specific software engineering environment (SEE). GRA

N92-27923# National Inst. of Standards and Technology, Gaithersburg, MD. Factory Automation Systems Div.
FORM ERROR MODELS OF THE NIST ALGORITHM TESTING SYSTEM
M. E. A. Algeo and T. H. Hopp Jan. 1992 13 p Sponsored in part by Navy
(PB92-172014; NISTIR-4740) Avail: NTIS HC/MF A03

The National Institute of Standards and Technology (NIST) Algorithm Testing System (ATS) is a software package for testing geometric fitting software. In order to create realistic test scenarios, the ATS provides the capability to generate test data that simulate part features with form errors. The form error models used in the Algorithm Testing System are presented. GRA

N92-27984# Naval Postgraduate School, Monterey, CA.
CONCEPT-FLOW DIAGRAMS: METHOD FOR DESIGN OF COMPUTER-AIDED INSTRUCTION M.S. Thesis
Dawn M. Maskell Mar. 1992 150 p
(AD-A246896) Avail: NTIS HC/MF A07

Current software design techniques are organized around either data transformation or stimulus-response control flow abstractions. Neither of these approaches apply to the flow of presentation and answer analysis that characterizes computer-aided instruction. This thesis introduces a new design abstraction, concept-flow, and technique that exploits it in the design of tutorial software. The design technique uses concept-flow diagrams, which highlight presentation of information and verification of user comprehension. The technique is explained through application to a tutorial on the physics of underwater sound. The design and implementation of a prototype concept-flow interpreter are presented. This design technique and the associated interpreter allow for rapid construction of highly flexible computer-based tutorial strategies, useful for both traditional CAI applications and for more efficient help-sequence design in interactive systems. GRA

N92-27995# Duke Univ., Durham, NC.
IMPLEMENTATION OF PARALLEL ALGORITHMS Quarterly Report, 1 Jul. - 30 Sep. 1991
John H. Reif 30 Sep. 1991 9 p
(Contract N00014-91-J-1985)
(AD-A248759) Avail: NTIS HC/MF A02

The investigation was centered on how to map context-free grammar recognition onto systolic arrays. We are currently in the final phases of the preparation of a technical report which will document this work. Current research efforts are to extend our method to other algorithms. A new method was developed for mapping algorithms into parallel architectures. This new method works very well for a class of dynamic programming problems, including CFG recognition. GRA

N92-28006# Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Lab.
ADAPTIVE COMPRESSION OF MULTISENSOR IMAGE DATA Final Report
Ernesto R. Cespedes Mar. 1992 204 p
(AD-A248389; WES/TR/EL-92-17) Avail: NTIS HC/MF A10

The objective of this study is to develop and test a methodology for the design of multisensor image compression systems. Data collected from an airborne active (laser) and passive (thermal) imaging system are analyzed, and an efficient adaptive transform coding method is developed to exploit the characteristics of the source. A number of adaptive techniques that compensate for the nonstationary nature of the source are evaluated, and a novel model-based bit allocation and quantization strategy is adopted. The compression/reconstruction scheme is implemented in a massively parallel processor, and a large number of multisensor images are processed in order to define the rate-distortion performance of the scheme. The utility of the reconstructed imagery is also evaluated by examining the performance of a multichannel target detection algorithm as a function of bit rate. GRA

N92-28048# Westinghouse Savannah River Co., Aiken, SC.
REVIEWS OF COMPUTING TECHNOLOGY: A REVIEW OF COMPOUND DOCUMENT ARCHITECTURES
B. J. Hudson 1 Oct. 1991 24 p
(Contract DE-AC09-89SR-18035)
(DE92-011375; WSRC-IM-90-83-5) Avail: NTIS HC/MF A03

This review of computing technology will define, describe, and give examples of various approaches to document management through the use of compound document architectures. Experts agree that only 10 percent of business information exists in machine readable form, but much of what is stored is not in useful form. As a result, the average business document is copied over a dozen times during its life and duplicate copies are stored in numerous locations. The goal of compound document architectures is to provide an information support environment where rapid access to the correct information in the proper format is simplified. A compound document architecture provides structure to seemingly unstructured electronic documents, and standardizes the methods for interchange and access of entire or partial documents by authors and users. DOE

N92-28049# Naval Postgraduate School, Monterey, CA.
ITERATIVE METHODS FOR ESTIMATION OF 2-D AR PARAMETERS USING A DATA-ADAPTIVE TOEPLITZ APPROXIMATION ALGORITHM M.S. Thesis
John C. Eremic Sep. 1991 58 p
(AD-A246009) Avail: NTIS HC/MF A04

A new two-dimensional data-adaptive algorithm utilizing the iterative Toeplitz approximation method is presented. This algorithm provides a robust and efficient means for accurate estimation of two-dimensional autoaggressive parameters representing spatially variant data arrays. Its convergence performance is comparable to that of the 2-D Recursive Least Squares (RLS) algorithm, but is computationally more efficient. The savings in computation is realized by reducing the size of the matrix to be inverted when solving the AR model normal equation. The ability of the algorithm to accurately estimate the model parameters using very small data sets and various windowing schemes are evaluated. Spectral estimates are compared for quarter-plane (QP), nonsymmetric half-plane (NSHP), and combined-quadrant (CQ) regions of support. Additionally, the algorithm is tested in noise cancellation and line enhancement applications using image arrays. This algorithm may be implemented for data-adaptive image processing or coding and for applications requiring 2-D spectral estimation. GRA

N92-28068# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
KNOWLEDGE-BASED NATURAL LANGUAGE UNDERSTANDING: A AAAI-87 SURVEY TALK
Wendy G. Lehnert 1991 69 p
(Contract N00014-87-K-0238)
(AD-A249120; COINS-TR-88-02) Avail: NTIS HC/MF A04

This overview is organized within a historical framework, although time limitations have forced me to invent a version of history that is necessarily incomplete. The title of the talk was given to me by the AAAI Program Committee, who wisely restricted the scope of my task by including the descriptor knowledge-based. This mercifully allowed me to ignore a large body of work that focuses exclusively on the syntactic structures of natural language. Even so, the body of work that can accurately be described as knowledge-based natural language understanding is large, and difficult to cover in the space of one hour. To maintain continuity, I utilized the recurring theme of weak methods vs. strong methods. This foundational theme helped me pare down my view of history and serves as my only defense against otherwise unforgivable omissions in the overview. Even so, it was difficult to pick and choose from the corpus of potentially relevant research, and the usual disclaimers about intelligible brevity at the cost of comprehensive coverage must be piously invoked to ward off inevitable accusations of ignorance, prejudice, and other sins associated with warped thinking. GRA

N92-28069# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
DOCUMENTATION REQUIREMENTS FOR SOFTWARE MAINTENANCE M.S. Thesis
Timothy S. McArthur Dec. 1991 111 p
(AD-A246716; AFIT/GSS/ENG/91D-9) Avail: NTIS HC/MF A06

This study investigated the requirement for documentation during the maintenance phase of the software life cycle. Without proper documentation, maintenance personnel are not able to effectively understand the design of a software system and spend many hours performing design recovery before any type of maintenance can be performed. A review of existing information showed a wide range of opinion among the experts in the field of software maintenance and was not conclusive. A survey of Air Force software maintenance personnel was then conducted to determine the need, availability, and tailoring results of the documents listed on DOD-STD 2167A. The analysis of this survey data showed that 11 of the 18 documents are required for maintenance. These include the specifications, design documents, user's manuals, and programmer's manuals. Plans, reports and background information should be provided to the management of the maintenance organization for initial planning of the maintenance activity. The only documents deemed not needed during the maintenance phase are those that are eventually incorporated into other documents that will be provided to the maintenance organization. The response to tailoring questions was insufficient and could not be used for a conclusive analysis. GRA

N92-28075# Stanford Univ., CA. Dept. of Computer Science.
RESEARCH INTO THE DESIGN AND IMPLEMENTATION OF KNOWLEDGE-BASE SYSTEM Final Technical Report, 1 Dec. 1990 - 30 Nov. 1991
Jeffrey D. Ullman 31 Jan. 1992 5 p
(Grant AF-AFOSR-0066-91)
(AD-A247039; AFOSR-92-0157TR) Avail: NTIS HC/MF A01

A working prototype of the NAIL system was implemented. This system extends SQL, providing a general purpose computing capability. The two elements of NAIL consist of GLUE, a logical rule formulation of SQL, and NAIL, a declarative language which generates GLUE code. Applications were demonstrated that implement a building construction schedule and a VLSI CAD logic simulator. Various query optimization algorithms were studied and implemented in NAIL. GRA

N92-28082# Rochester Univ., NY. Dept. of Computer Science.
THE RHET SYSTEM: A SEQUENCE OF SELF-GUIDED TUTORIALS
James F. Allen and Bradford W. Miller Jul. 1991 82 p
(Contracts F30602-91-C-0010; N00014-90-J-1811)
(AD-A248960; TR-325) Avail: NTIS HC/MF A05

The RHET system is a knowledge representation tool that is

intended to support the development of advanced prototype natural language understanding and planning systems. It is what is currently called a hybrid representation, which consists of a set of separately defined specialized reasoning systems that are presented to the user within a single uniform framework. It can be used as a horn-clause based theorem proving system, or it can be used as a rich frame-based representation, or used in any way falling between these styles of use. The primary specialized reasoning system, a temporal reasoning system, and a hierarchical context mechanism that support reasoning about different agent's beliefs as well as hypothetical reasoning. This report provides a sequence of tutorials each demonstrating a major feature of the system.
GRA

N92-28104# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
AN EXPERIMENTAL STUDY IN THE USE OF COMPUTER-BASED INSTRUCTION TO TEACH AUTOMATED SPREADSHEET FUNCTIONS M.S. Thesis
Russell A. Greene Sep. 1991 105 p
(AD-A246728; AFIT/GLM/LSR/91S-24) Avail: NTIS HC/MF A06

Educational institutions at all levels are increasingly examining the advantages of computer-based instruction (CBI) to augment or replace conventional classroom learning environments. This research measures the effectiveness and efficiency of a CBI program in relation to the same course content delivered in a conventional classroom mode of an undergraduate course that teaches students the basic concepts and techniques of automated (electronic) spreadsheets. A CBI program was created to mirror the in-class instructional material of the course. The performance of the students who took the course by CBI was compared to the performance of the students who took the course in the conventional mode. The CBI course was found to be significantly more efficient while producing learning effect similar to the conventional mode of instruction. The students' prior experience and knowledge levels were offset by learning in either instructional mode. The initially weaker students were not identifiably weaker after completing the course by either method. Self-reported prior experience was an effective indicator of the students' actual pre-course knowledge level, but not an indicator of the students' post course performance.
GRA

N92-28106# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
RELATIVE UTILITY OF SELECTED SOFTWARE REQUIREMENT METRICS M.S. Thesis
James H. Byers Dec. 1991 123 p
(AD-A246749; AFIT/GSS/LSY/91D-4) Avail: NTIS HC/MF A06

The objective of this study was to determine the relative utility of selected software requirement metrics in assessing the productivity of the software requirements analysis process and the quality of the products of this process. This objective was met by collecting information about the perceptions that practicing software professionals have of the usefulness of various requirement metrics. The study employed a two part methodology. The first part utilized Basili's goal/question/metric paradigm to identify specific goals of the measurement effort and to identify requirement metrics worthy of further investigation. The second part employed a typical research design to gather perceptions that software professionals have of the utility of several metrics selected from those identified earlier. The study produced inconclusive results and further research is recommended. Results were based on a small sample and the data only reiterated the mixed opinions that software professionals have of the usefulness of software metrics. One significant finding is the consensus that a metric must be precisely defined for it to be accepted by the software community.
GRA

N92-28150*# Research Inst. for Computing and Information Systems, Houston, TX.
RESEARCH INTO THE DEVELOPMENT OF A KNOWLEDGE ACQUISITION TAXONOMY Monthly Interim Progress Reports, Sep. 1990 - Jan. 1991
Pamela K. Fink (Southwest Research Inst., San Antonio, TX.) Jan. 1991 30 p
(Contract NCC9-16; RICIS Proj. ET-26)
(NASA-CR-189939; NAS 1.26:189939) Avail: NTIS HC/MF A03

Monthly progress reports for September 1990 to January 1991 are given. Topics that are briefly covered include problem solving and learning taxonomies, knowledge acquisition techniques, software design, air traffic control, and space shuttle flight control.
Author

N92-28163# Naval Postgraduate School, Monterey, CA.
THE DESIGN AND IMPLEMENTATION OF AN EXPANDER FOR THE HIERARCHICAL REAL-TIME CONSTRAINTS OF COMPUTER AIDED PROTOTYPING SYSTEM (CAPS) M.S. Thesis
Suleyman Bayramoglu Sep. 1991 439 p
(AD-A245914) Avail: NTIS HC/MF A19

As part of developing the Execution Support System of Computer-Aided Prototyping System (CAPS), there is a need to translate and schedule prototypes of hard real time systems whose specifications are defined in a hierarchical structure by using the Prototyping System Description Language (PSDL). We present a design and implementation of a PSDL expander in this thesis. The expander translates a PSDL prototype with an arbitrarily deep hierarchical structure into an equivalent two-level form that can be processed by the current implementations of the other CAPS tools. The design of the expander also provides for inheritance of timing constraints and static consistency checking. To establish a convenient representation of PSDL specifications, we define an Abstract Data Type (ADT) that provides an Ada representation of PSDL specification. The main idea behind the PSDL ADT is forming an abstract representation of PSDL to support software tools for analyzing, constructing, and translating PSDL programs. The PSDL ADT is built by using other common abstract data types, i.e., maps, sets, sequences, graphs, and stacks. The construction process of ADT itself is done by an LALR (1) parser, generated in Ada using the tools AYACC and AFLEX, a parser generator and a lexical analyzer.
GRA

N92-28169# Naval Postgraduate School, Monterey, CA.
AN EFFICIENT HEURISTIC SCHEDULER FOR HARD REAL-TIME SYSTEMS M.S. Thesis
John G. Levine Sep. 1991 119 p
(AD-A247322) Avail: NTIS HC/MF A06

The requirement for efficient scheduling algorithms for the development of hard real-time systems resulted in much effort directed toward the development of high performance scheduling algorithms. The algorithms developed up to this point for the Computer Aided Prototyping System (CAPS) do not satisfy the requirements for an efficient static scheduling algorithm. The existing static scheduler neither performs efficiently nor produces correct results for all input cases. This thesis represents the research conducted to develop a fast heuristic static scheduling algorithm based on the principles of simulated annealing. In addition, this thesis describes the development of new data structures that simplify the static scheduler and maximize system resources. Several of the existing scheduling algorithms were re-implemented to make use of the new data structures and provide correct results. Any feasible schedule produced by these scheduling algorithms guarantees that both timing and precedence constraints are met. The primary goal of this thesis was to produce an efficient and effective scheduler to support the CAPS system.
GRA

N92-27778*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
EXECUTIVE SYSTEM SOFTWARE DESIGN AND EXPERT SYSTEM IMPLEMENTATION
Cheryl L. Allen *In its* Automation and Robotics for Space-Based

Systems, 1991 May 1992 p 195-201 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

N92-27903# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain). Lab. de Guiado.
FUZZY GUIDANCE SYSTEM EVALUATION
J. R. Martin, F. Sanchez, P. V. Cuenca, L. M. Rodriguez, and J. B. Ecija *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 15 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27907*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.
FROM AN AUTOMATED FLIGHT-TEST MANAGEMENT SYSTEM TO A FLIGHT-TEST ENGINEER'S WORKSTATION
E. L. Duke, R. W. Brumbaugh, M. D. Hewett, and D. M. Tartt (G and C Systems, Inc., San Juan Capistrano, CA.) *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 12 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

62 COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

N92-27212# Naval Postgraduate School, Monterey, CA.
LOCAL AREA NETWORK (LAN) COMPATIBILITY ISSUES M.S. Thesis
Rita V. Espiritu Sep. 1991 95 p
(AD-A247249) Avail: NTIS HC/MF A05

This thesis presents a research study of local area network compatibility issues. Today's high performance and successful LANs must use hardware and software that is compatible with the network technology used. Compatibility, for the purposes of this research paper, means the ability to interface without special adapters or other devices and directly relates to the ease of the transfer of data or programs within the network and between systems. An understanding of compatibility issues can help network users and managers diagnose and resolve connectivity problems thus saving valuable time and money that can be used toward other productive endeavors within an organization. This thesis will discuss hardware and software concepts, LAN architecture, and design issues as they relate to network compatibility. A LAN Manager's Guide covering the above issues is included as an appendix. It is written specifically for the Administrative Sciences/Information Systems (AS/IS) computer network laboratories as supplemental information for students on LANs. Local Area Networks(LAN), LAN hardware and software compatibility issue, LAN Manager's Guide. GRA

N92-27525# Naval Postgraduate School, Monterey, CA.
APPLICATIONS OF HIGH SPEED NETWORKS M.S. Thesis
Olav Kvaslerud Sep. 1991 103 p
(AD-A246082) Avail: NTIS HC/MF A06

This thesis discusses the utility and application of high speed networks in the evolving technological environment of communications. In the early sections of this work the primary thesis explicitly presents the properties of fiber optics, existing and developing high speed networks, and applications of these high speed networks. The analysis and validation of this thesis leads to two major postulations. The first investigates the possibility of replacing the current communication network for the Aegis real-time combat system aboard Naval ships with a dual optical fiber ring. This network would consolidate all sensors, weapons, electronic equipment, and computers into a single communication network, possessing a simple topology, higher data transfer capability, and enhanced security. The network was also designed to accommodate the projected requirements of the next generation of surface combatant. The future system is expected to build upon the current Aegis combat system architecture, becoming more complex but remaining a well integrated and easily operable combat system. A high speed network based on FDDI (Fiber Distributed Data Network) can satisfy the demand for more bandwidth, integrating both real-time and other communication services aboard a ship. This paper supports the view that FDDI can not only successfully replace the current communications in a ship's combat system, but also provide an enhanced level of operation. GRA

N92-27586*# Computational Mechanics Co., Austin, TX.
A FORMAL MODEL OF ASYNCHRONOUS COMMUNICATION AND ITS USE IN MECHANICALLY VERIFYING A BIPHASE MARK PROTOCOL
J. Strother Moore Washington NASA. Langley Research Center Jun. 1992 55 p
(Contract NAS1-18878; RTOP 505-64-10-05)
(NASA-CR-4433; TR-68; NAS 1.26:4433) Avail: NTIS HC/MF A04

In this paper we present a formal model of asynchronous communication as a function in the Boyer-Moore logic. The function transforms the signal stream generated by one processor into the signal stream consumed by an independently clocked processor. This transformation 'blurs' edges and 'dilates' time due to differences in the phases and rates of the two clocks and the communications delay. The model can be used quantitatively to derive concrete performance bounds on asynchronous communications at ISO protocol level 1 (physical level). We develop part of the reusable formal theory that permits the convenient application of the model. We use the theory to show that a biphase mark protocol can be used to send messages of arbitrary length between two asynchronous processors. We study two versions of the protocol, a conventional one which uses cells of size 32 cycles and an unconventional one which uses cells of size 18. We conjecture that the protocol can be proved to work under our model for smaller cell sizes and more divergent clock rates but the proofs would be harder. Author

N92-27589*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
EXPERIMENTAL VALIDATION OF CLOCK SYNCHRONIZATION ALGORITHMS
Daniel L. Palumbo and R. Lynn Graham (PRC Kentron, Inc., Hampton, VA.) Jul. 1992 24 p
(RTOP 505-64-10-07)
(NASA-TP-3209; L-17015; NAS 1.60:3209) Avail: NTIS HC/MF A03

The objective of this work is to validate mathematically derived clock synchronization theories and their associated algorithms through experiment. Two theories are considered, the Interactive Convergence Clock Synchronization Algorithm and the Midpoint Algorithm. Special clock circuitry was designed and built so that several operating conditions and failure modes (including malicious failures) could be tested. Both theories are shown to predict conservative upper bounds (i.e., measured values of clock skew were always less than the theory prediction). Insight gained during experimentation led to alternative derivations of the theories. These new theories accurately predict the behavior of the clock system. It is found that a 100 percent penalty is paid to tolerate worst-case failures. It is also shown that under optimal conditions (with minimum error and no failures) the clock skew can be as much as three clock ticks. Clock skew grows to six clock ticks when failures are present. Finally, it is concluded that one cannot rely solely on test procedures or theoretical analysis to predict worst-case conditions. Author

N92-27605# Naval Postgraduate School, Monterey, CA.
IMPLEMENTATION OF A CONFIGURATION MANAGEMENT SYSTEM FOR A LOCAL AREA NETWORK M.S. Thesis
Mack L. Brewer Sep. 1991 57 p
(AD-A246474) Avail: NTIS HC/MF A04

A major concern of system managers in local area network

(LAN) environments is to keep track of each of the component and location of network nodes as well as the maintenance history of LAN nodes and accessories. The complexity of the technology and the variety of products used interchangeably make this task particularly hard. This thesis designs and implements a database application to facilitate this effort. It allows the LAN maintenance staff to manage the assets more efficiently and effectively. This system can also be adapted and applied to LAN systems throughout the DoD as required. GRA

N92-27748# Sandia National Labs., Albuquerque, NM.
MASSIVELY PARALLEL COMPUTING, C++, AND HYDROCODE ALGORITHMS
Allen C. Robinson, Arlo L. Ames, H. Eliot Fang, Dino Pavlakos, Courtenay T. Vaughan, and Philip Campbell (Cray Research, Inc., Albuquerque, NM.) 1992 8 p Presented at the American Society of Civil Engineers (ASCE) Conference, Dallas, TX, 7-9 Jun. 1992
(Contract DE-AC04-76DP-00789)
(DE92-006739; SAND-92-0031C; CONF-9206101-2) Avail: NTIS HC/MF A02

We describe the use of the object-oriented language C++ in the development of a hydrocode simulation system, PCTH. The system is designed to be horizontally and vertically portable from low-end workstations to next generation massively parallel supercomputers. The development of the PCTH system and the issues and rationale considered in moving to the object oriented paradigm will be discussed. DOE

N92-28173# Oak Ridge National Lab., TN.
PHASE MODELING OF A PARALLEL SCIENTIFIC CODE
P. H. Worley 1992 6 p Presented at the Scalable High Performance Computing Conference, Williamsburg, VA, 26-29 Apr. 1992
(Contract DE-AC05-84OR-21400)
(DE92-010292; CONF-9204106-2) Avail: NTIS HC/MF A02

This paper describes a performance model for a parallel program that solves the nonlinear shallow water equations using the spectral tranform method. The model is generated via a phase analysis, and consists of a sequence of simple models whose sum describes the performance of the entire code. This use of a sequence of simple models increases the range of validity of the model as the problem and machines parameters scale. DOE

63 CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

For related information see also *54 Man/System Technology and Life Support.*

N92-27368# Stanford Linear Accelerator Center, CA.
SLAC B FACTORY COMPUTING
P. F. Kunz Feb. 1992 7 p Presented at the 2nd International Workshop on Software Engineering, Artificial Intelligence, and Neural Nets for High Energy and Nuclear Physics, L'Agelonde, France, 13-18 Jan. 1992
(Contract DE-AC03-76SF-00515)
(DE92-010745; SU-SLAC-PUB-5759; CONF-920172-4) Avail: NTIS HC/MF A02

As part of the research and development program in preparation for a possible B Factory at SLAC, a group studied various aspects of HEP computing. In particular, the group is investigating the use of UNIX for all computing, from data acquisition, through analysis, and word processing. A summary of some of the results of this study will be given, along with some personal opinions on these topics. DOE

N92-27389# Columbia Univ., New York, NY. Dept. of Computer Science.
AUTOMATED GENERATION OF THREE-DIMENSIONAL VIRTUAL WORLDS FOR TASK EXPLANATION Quarterly Report, 1 Sep. - 30 Nov. 1991
Steven Feiner 30 Nov. 1991 2 p
(Contract N00014-91-J-1872)
(AD-A247859) Avail: NTIS HC/MF A01

Our work addresses the combined application of AI techniques and true 3D interaction and display devices to generate knowledge-based virtual worlds. The goal is to develop virtual environments that can explain physical tasks such as those involved in equipment maintenance and repair or training. In our research, we are exploring fundamental issues in the automated design both of self-contained virtual worlds and of augmented reality (in which generated graphics augments the user's view of the real world). GRA

N92-27441# Naval Postgraduate School, Monterey, CA.
AN APPROACH TO INTEGRATION OF REAL-TIME SOFTWARE FOR AN AUTONOMOUS UNDERWATER VEHICLE M.S. Thesis
Brent L. Leatherman Jun. 1991 76 p
(AD-A245377) Avail: NTIS HC/MF A05

The Naval Postgraduate School (NPS) is currently involved in a long term project to investigate and develop real-time software for command and control of Autonomous Underwater Vehicles (AUV). In support of this goal, NPS is currently designing and fabricating a testbed AUV. This thesis describes the design development, and testing of a real-time scheduling software package to act as the top layer of control software for the AUV. Also discussed are the various real-time scheduling policies available along with the features of the assigned operating systems that allow the implementation of the scheduler. GRA

N92-27755# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Statistics.
FAULT TOLERANT REAL-TIME SYSTEMS Report, 1 Oct. 1990 - 20 Sep. 1991
John P. Lehoczky 30 Sep. 1991 13 p
(Contract N00014-84-K-0734)
(AD-A246644) Avail: NTIS HC/MF A03

The ART (Advanced Real-Time Technology) Project is engaged in wide ranging research on hard real-time systems. The project has as its overall goal the development and demonstration of predictable and fault tolerant hard real-time computer systems. This research is being conducted in three interrelated areas. The development of a theory of hard real-time resource management including scheduling and synchronization. In addition, this theory is being applied in a wide range of contexts including databases, communication networks, operating systems and artificial intelligence. The design and construction of an operating system (ARTS) that supports predictable and fault tolerant real-time computer systems and demonstration and testing in the ARTS testbed to provide proof of concept and to gain understanding into aspects of the theory needing further refinement. A real-time version of the Mach operating system, RT-Mach, is also being developed as a part of the project. Development of hardware architectures and approaches to fault tolerance that can support predictable hard real-time computer systems. GRA

N92-27763*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AUTOMATION AND ROBOTICS FOR SPACE-BASED SYSTEMS, 1991
Robert L. Williams, II, ed. May 1992 254 p Workshop was held in Hampton, VA, 10 Dec. 1991
(RTOP 595-11-22)
(NASA-CP-10098; NAS 1.55:10098) Avail: NTIS HC/MF A12

The purpose of this in-house workshop was to assess the state-of-the-art of automation and robotics for space operations from an LaRC perspective and to identify areas of opportunity for future research. Over half of the presentations came from the

Automation Technology Branch, covering telerobotic control, extravehicular activity (EVA) and intra-vehicular activity (IVA) robotics, hand controllers for teleoperation, sensors, neural networks, and automated structural assembly, all applied to space missions. Other talks covered the Remote Manipulator System (RMS) active damping augmentation, space crane work, modeling, simulation, and control of large, flexible space manipulators, and virtual passive controller designs for space robots. For individual titles, see N92-27764 through N92-27782.

N92-27764*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SUMMARY OF COMPLIANT AND MULTI-ARM CONTROL AT NASA. LANGLEY RESEARCH CENTER
Fenton W. Harrison *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 1-17 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include the: single arm system, single arm axis system, single arm control systems, single arm hand controller axis system, single arm position axis system, single arm vision axis system, single arm force axis system, multi-arm system, multi-arm axis system, and the dual arm hand control axis system with control signals. Author

N92-27765*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
EVA ROBOTICS FOR SPACE STATION FREEDOM: DEXTROUS MANIPULATOR DEVELOPMENT (DEMAND)
Robert L. Williams, II *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 19-33 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: dextrous manipulator development (DMD), projected extravehicular activity (EVA) backlog, potential Special Purpose Dextrous Manipulator (SPDM) tasks, DMD Laboratory FY 1992-94, and program goals. Author

N92-27766*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
IVA ROBOTICS FOR SPACE STATION FREEDOM
Sharon Monica Jones *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 35-46 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The objective is to increase the scientific productivity of Space Station Freedom (Spacelab) during the man-tended phase and beyond. The topics are presented in viewgraph form and include: Space Station Freedom (SSF) background, man-tended phase, intra-vehicular activity (IVA) robotics, protein crystal growth experiment, thermal enclosure system equipment, and candidate mockup demonstrations. Author

N92-27767*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
HAND CONTROLLER STUDY OF FORCE AND CONTROL MODE
A. Terry Morris *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 47-58 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The objectives are to compare and evaluate the utility and effectiveness of various input control devices, e.g., hand controllers, with respect to the relative importance of force and operation control mode (rate or position) for Space Station Freedom (SSF) related tasks. The topics are presented in viewgraph form and include the: Intelligent Research Systems Lab (ISRL) experimental design; Telerobotic Systems Research Laboratory (TSRL) final experimental design; and factor analysis summary of results. Author

N92-27768*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
COHERENT LASER RADAR VISION SYSTEM AND TASKSPACE IDENTIFICATION
Hal Aldridge *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 59-66 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: Frequency Modulated Continuous Wave (FMCW) Laser Radar; a FMCW laser block diagram, current problems; and an individual fiber sensor. Author

N92-27769*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NEURAL NETWORKS MODELING AND CONTROL OF DYNAMICAL SYSTEMS
Don Soloway *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 67-84 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: an overview of research; first year research objectives (starting 5/91); background; current work; accomplishments from 5/91-9/91; and second year research objectives. Author

N92-27770*# Institute for Computer Applications in Science and Engineering, Hampton, VA.
ADAPTIVE ARTIFICIAL NEURAL NETWORK FOR AUTONOMOUS ROBOT CONTROL
Michael K. Arras, Peter W. Protzel, and Daniel L. Palumbo *In* NASA. Langley Research Center, Automation and Robotics for Space-Based Systems, 1991 May 1992 p 85-91 (For primary document see N92-27763 18-63)
(Contract NAS1-18605)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: neural network controller for robot arm positioning with visual feedback; initial training of the arm; automatic recovery from cumulative fault scenarios; and error reduction by iterative fine movements. Author

N92-27771*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
RMS ACTIVE DAMPING AUGMENTATION
Michael G. Gilbert, Michael A. Scott, and Martha E. Demeo *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 93-110 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: RMS active damping augmentation; potential space station assembly benefits to CSI; LaRC/JSC bridge program; control law design process; draper RMS simulator; MIMO acceleration control laws improve damping; potential load reduction benefit; DRS modified to model distributed accelerations; accelerometer location; Space Shuttle aft cockpit simulator; simulated shuttle video displays; SES test goals and objectives; and SES modifications to support RMS active damping augmentation. Author

N92-27772*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
A SPACE CRANE CONCEPT FOR PERFORMING ON-ORBIT ASSEMBLY
John T. Dorsey *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 111-121 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: in-space assembly and construction enhances future mission planning flexibility; in-space assembly and construction facility concept; space crane concept with mobile base; fundamental

characteristics; space crane research approach; spacecraft component positioning and assembly test-bed; and articulating joint testbed. Author

N92-27773*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ANALYSIS AND TESTING OF A SPACE CRANE ARTICULATING JOINT TESTBED
Thomas R. Sutter and K. Chauncey Wu *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 123-136 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: space crane concept with mobile base; mechanical versus structural articulating joint; articulating joint test bed and reference truss; static and dynamic characterization completed for space crane reference truss configuration; improved linear actuators reduce articulating joint test bed backlash; 1-DOF space crane slew maneuver; boom 2 tip transient response finite element dynamic model; boom 2 tip transient response shear-corrected component modes torque driver profile; peak root member force vs. slew time torque driver profile; and open loop control of space crane motion. Author

N92-27774*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
AUTOMATED ASSEMBLY OF LARGE SPACE STRUCTURES
Marvin D. Rhodes *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 137-151 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: the Telerobotic Assembly Facility; joint components; the robot end effector; assembly projected time; typical truss assembly breakdown; the Automated Structures Assembly Facility's current control hierarchy; an assembly problem summary; observations and results; sensor monitoring and error recovery; recommendations and conclusions; and current plans and development. Author

N92-27775*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
DEVELOPMENT OF A MACHINE VISION GUIDANCE SYSTEM FOR AUTOMATED ASSEMBLY OF SPACE STRUCTURES
Eric G. Cooper and P. Daniel Sydow *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 153-177 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: automated structural assembly robot vision; machine vision requirements; vision targets and hardware; reflective efficiency; target identification; pose estimation algorithms; triangle constraints; truss node with joint receptacle targets; end-effector mounted camera and light assembly; vision system results from optical bench tests; and future work. Author

N92-27776*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
END-EFFECTOR MICROPROCESSOR **c60**
William R. Doggett *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 179-186 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: automated structures assembly facility current control hierarchy; automated structures assembly facility purposed control hierarchy; end-effector software state transition diagram; block diagram for ideal install composite; and conclusions. Author

N92-27777*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PANEL INSTALLATION DEVELOPMENT IN AUTOMATED STRUCTURES ASSEMBLY LAB
Cuong Quach *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 187-193 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The design requirements for panel installation process are listed and photographs are presented of the following: panel latches to truss via adaptors; panel end effector; arm retrieving panel from canister; arm installing panel; and facility view with panel installed. Author

N92-27778*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
EXECUTIVE SYSTEM SOFTWARE DESIGN AND EXPERT SYSTEM IMPLEMENTATION **c61**
Cheryl L. Allen *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 195-201 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: software requirements; design layout of the automated assembly system; menu display for automated composite command; expert system features; complete robot arm state diagram and logic; and expert system benefits. Author

N92-27779*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
FUTURE WORK IN AUTOMATED ASSEMBLY OF LARGE SPACE STRUCTURES
Ralph Will *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 203-206 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: project development; current system upgrade requirements; and ASAL 1992 objectives. Author

N92-27780*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ON THE USE OF TORQUE-WHEELS FOR THE CONTROL OF LARGE, FLEXIBLE, SPACE-BASED TELEROBOTIC ARMS **c37**
Dave Ghosh, R. C. Montgomery, and S. P. Kenny *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 207-222 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are covered in viewgraph form and include: the problem; a potential solution -- endpoint control; modeling, analysis, and control system; evaluation task; system simulator; studies with-and-without torque wheels; and conclusions and future plans. Author

N92-27781*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
MODELING, CONTROL, AND SIMULATION OF FLEXIBLE LINK ROBOTIC SYSTEMS
Sean P. Kenny *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 223-232 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The topics are presented in viewgraph form and include: WBS program goal roadmap; integrated software environment; modeling software; control design interface; real time simulation; and graphics workstation. Author

N92-27782*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PASSIVE DYNAMIC CONTROLLERS FOR NON-LINEAR MECHANICAL SYSTEMS
Jer-Nan Juang, Shih-Chin Wu, Minh Phan, and Richard W. Longman *In its* Automation and Robotics for Space-Based Systems, 1991 May 1992 p 233-258 (For primary document see N92-27763 18-63)
Avail: NTIS HC/MF A12

The objective is to develop active model-independent controllers for slewing and vibration control of nonlinear multibody flexible systems, including flexible robots. The topics are presented in viewgraph form and include: passive stabilization; work-energy rate principle; Liapunov theory; displacement feedback; dynamic controller; displacement and acceleration feedback; velocity feedback; displacement feedback; physical interaction; a 6-DOF robot; and simulation results. Author

N92-27980# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
AN EXPLORATORY APPLICATION OF NEURAL NETWORKS TO THE SORTIE GENERATION FORECASTING PROBLEM M.S. Thesis
James M. Dagg Sep. 1991 181 p
(AD-A246626; AFIT/GLM/LSM/91S-11) Avail: NTIS HC/MF A09

This exploratory study assesses the accuracy of backpropagation neural networks in predicting sortie generations, given pre-specified levels of air base resources. Single hidden layer networks and two-way interaction regression metamodels were fitted to simulated data previously generated by way of a factional design for ten factors at two levels, and subsequently tested (cross-validated) via an independent testing sample. It was determined that regression metamodels were generally superior in predicting unseen cases, while their network counterparts exhibited far better goodness-of-fit characteristics. The research consistently emphasizes that goodness-of-fit in no way necessarily implies goodness-of-prediction, in that different non-equivalent statistical measures are required to assess both these phenomena. In spite of their relatively poor performance in predicting the test sample used in this study, experimental results indicate that future research focused on applying neural network modeling techniques to sortie generation prediction and the identification of critical air base resources is warranted. GRA

N92-27987# SRI International Corp., Menlo Park, CA. Artificial Intelligence Center.
AN EVOLUTIONARY APPROACH TO DESIGNING NEURAL NETWORKS Final Report, 15 Jul. 1989 - 14 Jul. 1991
Aviv Bergman Oct. 1991 53 p
(Contract F49620-89-K-0005)
(AD-A247003; AFOSR-02-0010TR) Avail: NTIS HC/MF A04

One of the most interesting properties of neural networks is their ability to learn appropriate behavior by being trained on examples. Established learning algorithms which typically work by minimizing error through backpropagation in weight space, tend to get stuck in local optima--a tendency typical of gradient-descent methods applied to nonconvex objectives functions. Therefore, for problems of nontrivial complexity these systems must be handcrafted to a significant degree, but, the distributed nature of neural network representations make this handcrafting difficult. We are investigating an evolutionary approach to learning that will avoid this problem. This approach simulates a variable population of networks which, through processes of mutation, combination, selection, and differential reproduction, converges to a group of networks well suited to solving the task at hand. The role of the different genetic operation, e.g., recombination and mutation was also studied. We use a Connection Machine to exploit the inherent parallelism in these simulations. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N92-27437# Defence Research Establishment Valcartier (Quebec).
A PROCEDURE FOR OBTAINING AN ALGEBRAIC APPROXIMATION TO CERTAIN INTEGRALS
B. T. Evans and G. R. Fournier Aug. 1991 42 p
(AD-A245371; DREV-4653/91) Avail: NTIS HC/MF A03

We have found a method for obtaining algebraic approximations to certain integrals that appears to be independent of known methods, such as Taylor, orthonormal functions, Laplaces method, etc. This method has the advantage of sometimes producing much more compact forms of the integral. It often gives results where the others may fail and in many cases the solutions are globally valid over the full range of each parameter. It sometimes allows for a trade-off between the accuracy and the functional complexity of the solution. Specific problems in the estimation of extinction from obscurants and other aerosols are for the first time completely resolved analytically. These analytical solutions are applicable to infrared and millimeter wave smokes as well as biological and natural aerosols. GRA

N92-27517*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
DEVELOPMENT OF AN ALGEBRAIC TURBULENCE MODEL FOR ANALYSIS OF PROPULSION FLOWS
N. J. Georgiadis, J. E. Drummond, and B. P. Leonard (Akron Univ., OH.) Jul. 1992 14 p Proposed for presentation at the 28th Joint Propulsion Conference and Exhibit, Nashville, TN, 6-8 Jul. 1992; sponsored by AIAA, SAE, ASME, and ASEE
(RTOP 537-02-23)
(NASA-TM-105701; E-7089; NAS 1.15:105701; AIAA-92-3861)
Avail: NTIS HC/MF A03

A simple turbulence model that will be applicable to propulsion flows having both wall bounded and unbounded regions was developed and installed within the PARC Navier-Stokes code by linking two existing algebraic turbulence models. The first is the Modified Mixing Length (MML) model which is optimized for wall bounded flows. The second is the Thomas model, the standard algebraic turbulence model in PARC which has been used to calculate both bounded and unbounded turbulent flows but was optimized for the latter. This paper discusses both models and the method employed to link them into one model (referred to as the MMLT model). The PARC code with the MMLT model was applied to two dimensional turbulent flows over a flat plate and over a backward facing step to validate and optimize the model and to compare its predictions to those obtained with the three turbulence models already available in PARC. Author

N92-27557*# Chicago Univ., IL.
A SIMPLE EXAMPLE OF MODELING HYBRID SYSTEMS USING BIALGEBRAS: PRELIMINARY VERSION
R. L. Grossman and R. G. Larson Dec. 1991 5 p
(Grant NAG2-513)
(NASA-CR-190331; NAS 1.26:190331) Avail: NTIS HC/MF A01

The authors describe how to construct a hybrid control system using a specific set of data and conditions specified within the paper. Furthermore, they give examples of how to create continuous systems, discrete systems, and simple hybrid systems. Finally, they touch upon Heisenberg and state space representation. H.A.

N92-27762# Ballistic Research Labs., Aberdeen Proving Ground, MD.
THE TENSOR EQUATION AX + XA = G Final Technical Report, Mar. - Jul. 1991
Mike Scheidler Feb. 1992 34 p
(AD-A246665; BRL-TR-3315) Avail: NTIS HC/MF A03

We study the second-order tensor equation AX + XA = G for symmetric, positive-definite A and arbitrary G. Motivated by applications in the continuum mechanics literature, we also examine some special cases where G depends on A and another tensor H. For arbitrary dimensions, we establish relations between the solutions X for various forms of G. These results, together with Rivlin's identities for tensor polynomials in two variables, are applied in two and three dimensions to obtain explicit formulas for X in direct (component-free) notation. The results include new formulas as well as new derivations of previously known formulas. An application to the kinematics of rigid motions is considered. GRA

N92-27834# Ballistic Research Labs., Aberdeen Proving Ground, MD.
EXPONENTIAL ERROR BOUNDS ON CODES FOR NOISY CHANNELS WITH INACCURATELY KNOWN STATISTICS AND FOR GENERALIZED DECISION RULES Final Technical Report, Oct. 1990 - Oct. 1991
D. Kazakos and A. B. Cooper, III Jan. 1992 23 p
(DA Proj. 1L1-61102-AH-43)
(AD-A246064; BRL-TR-3307) Avail: NTIS HC/MF A03

Generalized decoding decision rules provide added flexibility in a decoding scheme and some advantages. In a generalized decoding decision rule, the following possibilities are considered: (1) the decoder has the option of not deciding at all, or rejecting all estimates (this is termed an erasure) and; (2) the decoder has the option of putting out more than one estimate. The resulting output is called a list. Only if the correct code word is not on the list do we have a list error. Foreney developed error bounds in his seminal paper of 1968 in which he used Gallager's ingenious 1965 method of bounding error probabilities. We consider another realistic factor, the lack of exact knowledge of the channel statistics. We assume a mismatch between the true channel transition probabilities and the nominal probabilities used in the decoding metric. We then develop error bounds under mismatch for generalized decision rules. We also establish conditions under which the error probabilities converge to zero exponentially with the block length, in spite of the presence of mismatch. GRA

N92-27909# Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette (France).
BOUNDARY VALUE PROBLEMS ON S(EXP n) FOR SURFACES OF CONSTANT GAUSS CURVATURE
B. Guan and J. Spruck Nov. 1991 27 p Prepared in cooperation with Massachusetts Univ., Amherst
(Contract DE-FG02-86ER-250125; NSF DMS-88-02858)
(PB92-134410; IHES/M/91/80) Avail: NTIS HC/MF A03

The local regularity theory for classical Monge-Ampere equations in R exp n near the boundary of a domain with arbitrary geometry is re-examined. In particular, C exp 2 estimates for solutions assuming the structure conditions (locally) of theorem 1.5 are derived. These estimates are used in sections 4 and 5 in the study of boundary value problems on S exp n and also suffice to prove theorem 1.5. In section 3, they formulate the problem of Monge-Ampere type for radial graphs over S exp n that they will study in sections 4 and 5. Section 4 contains a proof of the strong compactness of solutions (and their strict local convexity) in C exp (2 + alpha). Because the kernel of the linearized operator may be nontrivial, these estimates do not immediately yield the desired existence result. Therefore, in section 5, they construct the solution directly by a monotone iteration scheme starting from the given strict subsolution. They modify the estimates of Section 4 and show the convergence of the sequence of approximations in C exp (2 + alpha) to the (unique) admissible solution closest to the subsolution. Author

N92-28060# Washington Univ., Saint Louis, MO. Dept. of Systems Science and Mathematics.
RESEARCH AND DEVELOPMENT OF THE p-VERSION OF THE FINITE ELEMENT MODEL Final Technical Report, 1 Oct. 1987 - 31 Oct. 1991
I. N. Katz, Barna A. Szabo, and A. P. Greensfelder 24 Feb. 1992 42 p
(Grant AF-AFOSR-0017-88)
(AD-A248582; SSM/92/1; AFOSR-92-0225TR) Avail: NTIS HC/MF A03

A new iteration, based on a textured model decomposition, is used to solve the assembled system of equations in the p-version of the finite element method for two-dimensional problems. Based on the hierarchic property of shape functions on a rectangle, a superelement consisting of four adjacent rectangles is constructed, and then partitioned into three blocks. The iteration is used to implement the p-version in parallel on an N-cube. Load balance and speed-up ratios are investigated. A new approach for analyzing fastened structural connections based on the p-version is studied. This approach takes nonlinearities into account. Model predictions are found to be in good agreement with experimental results reported. GRA

N92-28061# University of Southern California, Los Angeles. Dept. of Mathematics.
MATHEMATICAL AND NUMERICAL ANALYSIS ASPECTS OF QUASI-NEURAL NETWORKS Final Technical Report, 1 Aug. 1988 - 30 Sep. 1991
Edward K. Blum 27 Feb. 1992 12 p
(Grant AF-AFOSR-0245-88)
(AD-A248583; AFOSR-92-0226TR) Avail: NTIS HC/MF A03

Basic results were obtained and published on the mathematical characterization of feed-forward and recurrent neural networks. It was shown how to approximate any continuous function by a 3-layer feed-forward network. The fixed-points and oscillations of recurrent networks were analyzed. GRA

N92-28144# San Diego State Univ., CA. Center for Research in Mathematics and Science Education.
SCHEMAS IN PROBLEM SOLVING: AN INTEGRATED MODEL OF LEARNING, MEMORY, AND INSTRUCTION Final Report, 1 Oct. 1989 - 31 Dec. 1991
Sandra P. Marshall Jan. 1992 62 p
(Contract N00014-89-J-1143)
(AD-A246882; CRSE-91-02) Avail: NTIS HC/MF A04

This final report contains two papers. The first describes statistical and cognitive models used to simulate student performance. The statistical model provides information about how the group of students as a whole performed on an identification task involving word-problem situations and shows differences among subgroups. The cognitive model is a connectionist network that simulates the performance of each student and yields details about how learning varied from one individual to another. The second paper outlines a hybrid model of schema knowledge that joins a connectionist network with a production system. Details of the model are provided, and an example of its output is presented. GRA

N92-28189# Maryland Univ. Baltimore County, Catonsville.
NUMERICAL TREATMENT OF DIFFERENTIAL AND INTEGRAL EQUATIONS BY THE p AND h-p VERSIONS OF THE FINITE ELEMENT METHOD Final Report, 1 Jan. 1989 - 31 Dec. 1991
Manil Suri and Christoph Schwab Jan. 1992 13 p
(Grant AF-AFOSR-0252-89)
(AD-A247202; AFOSR-92-0155TR) Avail: NTIS HC/MF A03

The problem of locking, which arises in the approximation of parameter dependent problems, has been extensively investigated. A general theoretical framework to analyze this phenomenon has been developed, and the locking and robustness of different finite element schemes for various problems has been characterized. Work on the p and h-p versions of the finite element method has continued. Progress here includes optimal approximation results for the p version of the boundary element method in three dimensions, an analysis of a p version mixed method for quasilinear problems, and investigation of quadrature schemes and related errors. Additional work has been conducted on singularities of solutions for the three dimensional elasticity and hydro dynamics equations in domains with edges and vertices, on the numerical evaluation of singular surface integrals in the boundary element method, and the calculation of optimal shear correction factors for plate models. GRA

N92-28210*# Computer Sciences Corp., Lanham, MD. System Sciences Div.
ATTITUDE DETERMINATION ERROR ANALYSIS SYSTEM (ADEAS) MATHEMATICAL SPECIFICATIONS DOCUMENT
Mark Nicholson, F. Markley, and E. Seidewitz 24 Oct. 1988 183 p
(Contract NAS5-31500)
(NASA-CR-189281; NAS 1.26:189281; CSC/TM-88/6001) Avail: NTIS HC/MF A09

The mathematical specifications of Release 4.0 of the Attitude

Determination Error Analysis System (ADEAS), which provides a general-purpose linear error analysis capability for various spacecraft attitude geometries and determination processes, are presented. The analytical basis of the system is presented. The analytical basis of the system is presented, and detailed equations are provided for both three-axis-stabilized and spin-stabilized attitude sensor models. Author

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N92-27205# Aeronautical Research Labs., Melbourne (Australia).
VISIT TO CALTECH AND CERRA/ICASP6 RELIABILITY CONFERENCE
D. G. Ford Oct. 1991 23 p Presented at the California Inst. of Tech., Pasadena, CA, and the 6th International Conference on Applications of Statistics and Probability in Civil Engineering, Mexico City, 17-21 Jun. 1991
(AD-A246432; ARL-STRUC-TM-579; DODA-AR-006-654) Avail: NTIS HC/MF A03

This memo describes discussions with three materials researchers at the California Institute of Technology, Pasadena, and the Sixth International conference on Applications of Statistics and Probability in Civil engineering, Mexico City, June 17-21 1991 at which the author presented a paper about predicting fatigue life distributions with FRAN. GRA

N92-27334# Technion - Israel Inst. of Tech., Haifa. Faculty of Industrial and Management Engineering.
THEORY AND APPLICATION OF RANDOM FIELDS Final Technical Report, 1 Jan. 1989 - 31 Dec. 1991
Robert J. Adler 9 Jan. 1992 22 p
(Grant AF-AFOSR-0261-89)
(AD-A246958; AFOSR-92-0156TR) Avail: NTIS HC/MF A03

This report covers research performed under the three years of the grant. Main progress has been in the areas of modelling problems related to measure valued diffusions, in the completion of a monograph on the properties and structure of Gaussian processes on general parameter spaces, and level crossing problems. GRA

N92-27384# Naval Postgraduate School, Monterey, CA.
APPROXIMATE CONFIDENCE LIMIT PROCEDURES FOR COMPLEX SYSTEMS M.S. Thesis
Kah-Chee Yee Sep. 1991 129 p
(AD-A247253) Avail: NTIS HC/MF A07

Lower confidence limit estimation procedures for the reliability of several systems are developed and their accuracies evaluated using computer simulation. The procedures use test data on components of the system which can have failure times with either exponential or Weibull distributions or both. Testing scenarios for the components can be truncated by number of failures or by planned test times. Although the evaluation effort was focussed on series systems in this thesis, the procedures readily apply to other systems as described. The evaluations demonstrate the procedures to be quite accurate when sufficient component testing is performed. Two FORTRAN computer programs were written to perform the evaluation. They are annotated in Users' Guides and can be used to determine the accuracy of these approximate lower confidence limit procedures for a given specific system and associated set of input parameters. GRA

N92-27406# Universitaet der Bundeswehr Muenchen, Neubiberg (Germany, F.R.). Forschungsschwerpunkt Simulation und Optimierung Deterministischer Stochastischer Dynamischer Syst.
FRAMEWORK OPTIMIZATION USING STOCHASTIC GRADIENT PROCESS [OPTIMIERUNG VON TRAGWERKEN MITTELS STOCHASTISCHER DRADIENTENVERFAHREN]
R. Ebert Mar. 1991 76 p In GERMAN
(ETN-92-90828) Avail: NTIS HC/MF A05

A process which allows reliable and quick optimization of framework with stochastic distributed parameters is presented. A gradient process is used, with a special incrementation control. A difference process was programmed for the numerical calculation of the stochastic gradients in order to make the process utilization universal. The emphasis was put on the reliablity of results. All computations were carried out analytically. ESA

N92-27568# Naval Postgraduate School, Monterey, CA. Dept. of Operations Research.
EQUATIONS FOR APPROXIMATE LOWER CONFIDENCE LIMITS ON PROCESS CAPABILITY INDICES
W. M. Woods Dec. 1991 9 p
(AD-A247591; NPSOR-92-009) Avail: NTIS HC/MF A02

Equations that provide approximate but highly accurate lower confidence limits on process capability indices are provided. These equations yield the same value to the nearest hundredth or better than the values provided in tables in the literature. These equations can be used for a much more extensive set of data than those of the existing set of tables. GRA

N92-27578# Naval Postgraduate School, Monterey, CA.
AN INVESTIGATION OF MULTIVARIATE ADAPTIVE REGRESSION SPLINES FOR MODELING AND ANALYSIS OF UNIVARIATE AND SEMI-MULTIVARIATE TIME SERIES SYSTEMS Ph.D. Thesis
James G. Stevens Sep. 1991 207 p
(AD-A246155) Avail: NTIS HC/MF A10

The use of multivariate adaptive regression splines (MARS), for nonlinear regression modeling and analysis of time series systems, is presented. MARS can be conceptualized as a generalization of recursive partitioning that uses spline fitting in lieu of other simple fitting functions. MARS is a computationally intensive methodology that fits a nonparametric regression model in the form of an expansion in product spline basis functions of predictor variables chosen during a forward and backward recursive partitioning strategy. The MARS algorithm produces continuous nonlinear regression models for high-dimensional data using a combination of predictor variable interactions and partitions of the predictor variable space. By letting the predictor variables in the MARS algorithm be lagged values of a time series system, one obtains a univariate (ASTAR) or semi-multivariate (SMASTAR) adaptive spline threshold autoregressive model for nonlinear autoregressive threshold modeling and analysis of time series, thereby extending the threshold autoregression (TAR) time series methodology. GRA

N92-27588*# Alabama Univ., Huntsville. Dept. of Mathematical Sciences.
BIVARIATE EXTREME VALUE DISTRIBUTIONS
M. Elshamy Washington NASA. Marshall Space Flight Center Jun. 1992 40 p
(Contract NAS8-37585)
(NASA-CR-4444; M-689; NAS 1.26:4444) Avail: NTIS HC/MF A03

In certain engineering applications, such as those occurring in the analyses of ascent structural loads for the Space Transportation System (STS), some of the load variables have a lower bound of zero. Thus, the need for practical models of bivariate extreme value probability distribution functions with lower limits was identified. We discuss the Gumbel models and present practical forms of bivariate extreme probability distributions of Weibull and Frechet types with two parameters. Bivariate extreme value probability distribution functions can be expressed in terms of the marginal extremel distributions and a 'dependence' function subject to certain analytical conditions. Properties of such bivariate extreme distributions, sums and differences of paired extremals, as well as the corresponding forms of conditional distributions, are discussed. Practical estimation techniques are also given. Author

N92-27852# Naval Postgraduate School, Monterey, CA.
SEARCHING FOR SHORTEST AND SAFEST PATHS ALONG OBSTACLE COMMON TANGENTS M.S. Thesis
Jerry A. Crane Sep. 1991 197 p
(AD-A247929) Avail: NTIS HC/MF A09

This thesis describes a method for computing globally shortest paths for a point robot in a two-dimensional, orthogonal world composed of convex and concave polygons through the construction of obstacle common tangent visibility graphs. Visibility and intersection testing are based on the orientation of three or more points in the plane, and complex obstacle tangent visibility graphs are constructed using only these orientation relationships. Obstacle common tangents for convex and concave polygonal obstacles are implemented as a computational representation of locally shortest paths. A series of tangent sequences form global paths which equate to global path equivalence classes, effectively reducing the path finding problem to that of finding the shortest path in the path equivalence class. A simple and logical approach for processing concave polygons using convex subpolygons is implemented, allowing common tangent construction and path searching algorithms to process complex geometrical shapes in an efficient and symbolically unique fashion. Dijkstra's algorithm is implemented using heuristic control for optimal path searching. The framework for utilizing constant clearance strips for safe path planning along obstacle common tangents is presented but not fully implemented. GRA

N92-27915# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
A CRAMER-RAO TYPE LOWER BOUND FOR ESSENTIALLY UNBIASED PARAMETER ESTIMATION
A. O. Hero 3 Jan. 1992 74 p
(Contract F19628-90-C-0002)
(AD-A246666; TR-890; ESD-TR-91-104) Avail: NTIS HC/MF A04

In this report a new Cramer-Rao (CR) type lower bound is derived which takes into account a user-specified constraint on the length of the gradient of estimator bias with respect to the set of underlying parameters. If the parameter space is bounded, the constraint on bias gradient translates into a constraint on the magnitude of the bias itself; the bound reduces to the standard unbiased form of the CR bound for unbiased estimation. In addition to its usefulness as a lower bound that is insensitive to small biases in the estimator, the rate of change of the new bound provides a quantitative bias sensitivity index for the general bias-dependent CR bound. An analytical form for this sensitivity index is derived which indicates that small estimator biases can make the new bound significantly less than the unbiased CR bound when important but difficult-to-estimate nuisance parameters exist. This implies that the application of the CR bound is unreliable for this situation due to severe bias sensitivity. As a practical illustration of these results, the problem of estimating elements of the 2 x 2 covariance matrix associated with a pair of independent identically distributed (IID) zero-mean Gaussian random sequences is presented. GRA

N92-28140# Stanford Univ., CA. Dept. of Operations Research.
GRADIENT ESTIMATION FOR RATIOS
Peter W. Glynn, Pierre LEcuyer, and Michel Ades Aug. 1991 10 p
(Contract DAAL03-91-G-0101)
(AD-A248453; TR-70) Avail: NTIS HC/MF A02

The ratio estimation problem arises in many different applications settings. This paper is concerned with the interplay between gradient estimation and ratio estimation. Given unbiased estimators for the numerator and the denominator of the ratio, as well as their gradients, joint central-limit theorems for the ratio and its gradient are derived. The resulting confidence regions are of potential interest when optimizing such ratios numerically, or for sensitivity analysis with respect to parameters whose exact value is unknown. The paper also briefly discusses low-bias estimation for the gradient of a ratio. GRA

N92-28182# Stanford Univ., CA. Dept. of Operations Research.
CONDITIONS FOR THE APPLICABILITY OF THE REGENERATIVE METHOD
Peter W. Glynn and Donald L. Iglehart Sep. 1991 11 p
(Contract DAAL03-91-G-0101)
(AD-A248598; SU-TR-71; ARO-28809.3-MA-SDI) Avail: NTIS HC/MF A03

The regenerative method for estimating steady-state parameters is one of the basic methods in the simulation literature. This method depends on central limit theorems for regenerative processes and weakly consistent estimates for the variance constants arising in the central limit theorem. A weak sufficient (and probably necessary) condition for both the central limit theorems and consistent estimates is given. Several references have claimed, without proof, strong consistency of the variance estimates under our condition. This claim seems to us unjustified and we hope this note helps clarify the situation. Also discussed is the relationship between conditions for the validity of the regenerative method and those for the validity of the standardized time series methods. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N92-27423# National Academy of Sciences - National Research Council, Washington, DC. Commission on Engineering and Technical Systems.
STAR 21: STRATEGIC TECHNOLOGIES FOR THE ARMY OF THE TWENTY-FIRST CENTURY
1992 324 p
(Contract DAAG29-85-C-0008)
(Rept-92-8945; ISBN-0-309-04629-7) Avail: NTIS HC/MF A14

The Strategic Technologies for the Army Report (STAR) explores the implications of new or anticipated technologies to the ways in which the U.S. Army will be prepared to fight during the next 30 years. Technologies are identified which will most likely be important to ground warfare, a technology management strategy is recommended and some probable consequences of technology are projected for the Army's force structure and strategy. The environment the Army is likely to be facing in the next 30 years is introduced. Systems concepts are used to envision ways that the Army might use advanced technology in its principal mission areas. Future prospects for individual technologies of relevance to Army applications are forecasts, based on assessment of current research and development work in each area and expected advances. A short list is described of specific technologies selected by the STAR study participants for their potentially high payoff for the Army. Management recommendations are presented. Potential implications of technology for Army force structure and strategy are discussed. Major conclusions and recommendations are summarized. Author

N92-27658# Air Force Inst. of Tech., Wright-Patterson AFB, OH. Foreign Technology Div.
SOME ADVANCES IN US SPACE DEFENSE SYSTEMS
Rongrui Wang 10 Dec. 1991 17 p Transl. into ENGLISH from Jiguang Yu Hongwai (China), v. 19, no. 19, 1989 p 15-19
(AD-A246038; FTD-ID(RS)T-1472-90) Avail: NTIS HC/MF A03

This article, by way of a simple summary, introduces certain aspects of the U.S. Star Wars program which have undergone developments recently as well as experimentation planned in the future. In 1984, the U.S. Defense Department set up a Strategic Defense authority in order to carry out the Star Wars Program and put vigorous effort into the development of directed energy weapon, kinetic energy weapons, as well as research on a set of technologies such as early warning, aiming, tracking, and target recognition. This article, on the basis of openly published U.S.

sources, takes a comprehensive look at the status of several areas of development in U.S. space defense systems. GRA

N92-27888# Royal Air Force, London (England). Combat Operations Centre.
INTERDICTION MISSION PLANNING AND CO-ORDINATION DURING THE GULF CONFLICT 17 JANUARY - 27 FEBRUARY 1991
V. A. Mee and P. J. Goodman *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 5 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27889# Physics and Electronics Lab. TNO, The Hague (Netherlands).
AIRPOWER PLANNING AND BATTLE MANAGEMENT TRAINING AT AIRBASE LEVEL
P. Schulein and R. F. W. M. Willems *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 9 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27891# Thomson-CSF, Bagneux (France).
AIR SITUATION ESTABLISHMENT IN A MOBILE MULTISENSOR ENVIRONMENT
C. Rivierre and M. Desbois *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 5 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27892*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SITUATION ASSESSMENT IN THE PALADIN TACTICAL DECISION GENERATION SYSTEM
John W. McManus, Alan R. Chappell (Lockheed Engineering and Sciences Co., Hampton, VA.), and P. Douglas Arbuckle *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 16 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27893# Institute of Aviation Medicine, Farnborough (England).
A TEAMWORK MODEL OF PILOT AIDING: PSYCHOLOGICAL PRINCIPLES FOR MISSION MANAGEMENT SYSTEMS DESIGN
R. M. Taylor and S. J. Selcon *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 14 p (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-27899# Mitre Corp., Bedford, MA.
TECHNOLOGY AND STANDARDS FOR A COMMON AIR MISSION PLANNER
Ellen K. Kriegel and Joseph K. DeRosa *In* AGARD, Air Vehicle Mission Control and Management Mar. 1992 17 p Sponsored by AFSC (For primary document see N92-27887 18-01)
Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N92-27348# California Univ., Berkeley. Lawrence Berkeley Lab.
INTRODUCTION TO THE DIFFERENTIAL GEOMETRY OF QUANTUM GROUPS
B. Zumino 31 Oct. 1991 11 p Presented at the 10th IAMP Congress on Mathematical Physics, Leipzig, Germany, 30 Jul. - 9 Aug. 1991
(Contract DE-AC03-76SF-00098)
(DE92-010476; LBL-31432; CONF-9107201-1; UCB-PTH-62/91)
Avail: NTIS HC/MF A03

An introduction to the noncommutative differential calculus of quantum groups is presented. The invariant group average is also discussed. DOE

N92-27556# Tata Inst. of Fundamental Research, Bombay (India). School of Mathematics.
DEFORMATIONS OF COMPLEX STRUCTURES ON GAMMA/SL2(C) AND COHOMOLOGY OF LOCAL SYSTEMS
C. S. Rajan 1992 9 p
Avail: NTIS HC/MF A02

Let G be a connected complex semisimple Lie group. Let Gamma be a cocompact lattice in G. Matsushima raised the question whether the canonical complex structure on X = Gamma/G is locally rigid. Raghunathan showed that whenever G has no three dimensional components, the canonical complex structure on Gamma/G is locally rigid. In this paper, we show that when G is SL(sub 2)(C), nontrivial deformations of the canonical complex structure on X exist if and only if the first Betti number of the lattice Gamma is non-zero. We also show that the holomorphic representations rho of G not occurring in H(sup i)(X,O) for any i greater than or equal to 0 are precisely those for which H(sup i)(Gamma,rho) = (0) for all i greater than or equal to 0. Author

N92-27854# Netrologic, Inc., San Diego, CA.
FRACTAL IMAGE ENCODING Quarterly Progress Report
Yuval Fisher and Albert Lawrence 18 Mar. 1992 7 p
(Contract N00014-91-C-0117)
(AD-A248003) Avail: NTIS HC/MF A02

Rapid image decompression is crucial for many potential Navy and commercial users of the fractal image compression scheme. The focus of the work was the development of IFS algorithms and computer code for image compression, the refinement of algorithms and computer code for compressing color images, and the development of wavelet methods for image compression. Our improvements in the compression algorithm have shortened image compression times significantly. GRA

70 PHYSICS (GENERAL)

For precision time and time interval (PTTI) see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics.*

N92-27411# Argonne National Lab., IL.
EDGE EFFECTS ON FORCES AND MAGNETIC FIELDS PRODUCED BY A CONDUCTOR MOVING PAST A MAGNET
T. M. Mulcahy, J. R. Hull, J. D. Almer, and T. D. Rossing (University of Northern Illinois, De Kalb.) 1992 4 p Presented at the International Magnetics Conference, Saint Louis, MO, 13-16 Apr. 1992
(Contract W-31-109-eng-38)
(DE92-010502; ANL/CP-74708; CONF-920408-1) Avail: NTIS HC/MF A01

Experiments were performed to further investigate the forces acting on magnets moving along and over the edge of a continuous conducting sheet and to produce a comprehensive data set for the validation of analysis methods. Mapping the magnetic field gives information about the eddy currents induced in the conductor, which agrees with numerical calculations. DOE

N92-27638# Dalhousie Univ., Halifax (Nova Scotia). Dept. of Physics.
APPLICATION OF THE RENORMALIZATION GROUP TO CRITICAL PHENOMENA IN MAGNETIC SYSTEMS Ph.D. Thesis
Nahomi M. Fujki Jul. 1989 212 p
(ISBN-0-315-56216-1; CTN-92-60455) Copyright Avail:

Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Applications of renormalization group methods to the study of critical phenomena in magnetic systems are discussed. A real space renormalization group method is applied to short range interaction systems. A systematic development of the method by high temperature series expansions is given and tested on square and triangular lattices. A weight function appropriate to a graphical description is introduced. Field-theoretic renormalization group methods for dipolar magnetic systems show that uniaxial dipolar systems have unusual critical properties including an upper critical dimension of d(sub c)=3. An efficient method of dipolar summation is presented and applied to several lattice systems. In particular, it is shown that the dipolar interaction can cause uniaxial spin anisotropy in hexagonal close-packed gadolinium. Crossover effects in gadolinium are discussed and reduced crossover temperatures are obtained. Motivated by the role of the spin-spin pair correlation function for scattering cross-sections and the resistivity of gadolinium, the correction to scaling behavior of the pair correlation function for systems at the upper critical dimension is studied using renormalized perturbation theory and the operator product expansion. Author (CISTI)

N92-28146# Naval Postgraduate School, Monterey, CA.
EFFECTS OF NON-NORMAL OUTLIER-PRONE ERROR DISTRIBUTION ON KALMAN FILTER TRACK M.S. Thesis
Jose B. DeSouzaNeto Sep. 1991 69 p
(AD-A247036) Avail: NTIS HC/MF A04

This report is about the effects of non-normality on the efficiency of the Kalman filter, particularly when the distribution of measurement errors is still symmetric but the tails are extended, which means that the observations are outlier-prone. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environmental Pollution.*

N92-27202# Naval Postgraduate School, Monterey, CA.
INVESTIGATION OF A HEAT DRIVEN THERMOACOUSTIC PRIME MOVER ABOVE ONSET OF SELF-OSCILLATION M.S. Thesis
Earl C. Bowers Sep. 1991 63 p
(AD-A246257) Avail: NTIS HC/MF A04

The goal of this thesis is to investigate the work output of a heat driven thermoacoustic prime mover above onset of self-oscillation. The exponentially growing sound wave, generated when a prime mover is initially 'turned on,' was digitally sampled for a helium filled prime mover at pressures ranging from 238 kPa to 500 kPa and at temperature differences ranging from onset to 400 K. This data was then digitally filtered by a 100 Hz band pass filter centered on the prime mover's fundamental frequency. A least mean squares fit was applied to the envelope of the filter's output in order to determine the temporal absorption coefficient, beta. From beta, the quality factor was computed. These quality factors were then compared to thermoacoustic theory. The agreement between the theoretical predictions and the measured results is extremely good at high mean gas pressures. As the mean gas pressure decreases, however, the agreement between the theoretical value of onset and the predicted slope of the data, increasingly deviate. GRA

N92-27369# Naval Postgraduate School, Monterey, CA.
TESTING THE ACCURACY OF A THREE-DIMENSIONAL ACOUSTIC COUPLED MODE MODEL M.S. Thesis
Hiroyuki Ogawa Dec. 1991 55 p
(AD-A247149) Avail: NTIS HC/MF A04

The three-dimensional coupled mode sound propagation model of Chiu and Ehret (1990) is tested for its accuracy in modeling horizontal sound refraction. This test is achieved by comparing results generated by this model with exact analytic solutions to a parabolic approximation of the Helmholz Equation (Seigmann et al., 1990). Specifically, the acoustic wavefields associated with two cases of horizontally variable sound speed are considered. In Case 1, the sound speed varies only with azimuth, while in Case 2 there is radial and azimuth variation. The acoustic quantities used for the comparison include the modal modulation envelopes and transmission loss. Errors in the mode amplitude and phase are quantified and the significance of horizontal refraction is discussed. GRA

N92-27532# Naval Postgraduate School, Monterey, CA.
MONITORING OF GLOBAL ACOUSTIC TRANSMISSIONS: SIGNAL PROCESSING AND PRELIMINARY DATA ANALYSIS M.S. Thesis
Gary R. Frogner Sep. 1991 137 p
(AD-A246572) Avail: NTIS HC/MF A07

A great deal of controversy exists concerning the possible global warming trend which may occur as a result of a documented increase in atmospheric greenhouse gasses. The 1991 Heard Island Feasibility Experiment tested the feasibility of using transmissions of acoustic energy through major ocean basins of the world to monitor spatially averaged global temperature trends. This thesis documents the Naval Postgraduate School's reception of the phase encoded signal transmitted from the Southern Indian Ocean, development of real-time signal processing software, and preliminary data analysis. Data, received from a 32-channel vertical array suspended in the deep sound channel off the coast of Monterey, CA, was processed using real-time capable software. Data processing to reduce noise, determine SNR, and remove the m-sequence coding was found to be quite sensitive to Doppler frequency shifts. Although the SNR of the raw data was only about -27.5 dB for individual hydrophones, the transmitted signal was detected in both the frequency and time domains. However, the maximum processed signal peak in the time domain had an SNR of only +9 dB which is insufficient for use in a long term global temperature monitoring project. The hydrophone provides inadequate arrival time resolution. GRA

N92-27751# Naval Postgraduate School, Monterey, CA.
EMITTANCE MEASUREMENT OF THE NAVAL POSTGRADUATE SCHOOL LINEAR ACCELERATOR USING OPTICAL TRANSITION RADIATION TECHNIQUES M.S. Thesis
Mark J. Hellstern Sep. 1991 128 p
(AD-A246399) Avail: NTIS HC/MF A07

Using Optical Transition Radiation (OTR) beam diagnostics and Dr. Rule's clear foil interferometer analytic code, the normalized emittance of the Naval Postgraduate School (NPS) Linear Accelerator (linac) has been measured: the normalized horizontal emittance of 97(pi) +/- 10(pi) mm-mrad and the normalized vertical emittance of 54(pi) +/- 8(pi) mm-mrad. The experiment was performed independently twice using a Kapton foil/silicon mirror and a nitrocellulose foil/aluminum mirror Wartski interferometer. The Kapton foil provided an initial measurement of the emittance, and provided lessons learned for the nitrocellulose foil measurement. The emittance measurement of the NPS linac indicate that the value maybe too high for most free electron laser applications, but is very useful for radiation effect studies in high temperature superconductors, hardening, beam diagnostics, and for the production of x-rays through novel mechanisms such as transition radiation and parametric x-radiation generation. The beam divergence was determined by comparing theoretically calculated OTR patterns with the experimental data OTR patterns. GRA

N92-27924# Army Aviation Technical Test Center, Fort Rucker, AL.
STEADY-STATE ACOUSTICAL NOISE MEASUREMENTS IN AVIATION SYSTEMS Final Report
28 Feb. 1992 11 p
(AD-A247831; AATTC-TOP-7-3-530) Avail: NTIS HC/MF A03

This TOP describes procedures for measuring acoustical noise levels in Army helicopters. It covers tests for steady-state acoustical noise at crewstations and in the passenger compartment. GRA

N92-27998 Department of the Navy, Washington, DC.
OPTICALLY STABLE, LARGE TIME BANDWIDTH ACOUSTO-OPTIC HETERODYNE SPECTRUM ANALYZER WITH FIXED NON-ZERO HETERODYNE OUTPUT Patent
John N. Lee, inventor (to Navy) and Ray B. Brown, Jr., inventor (to Navy) 2 Jul. 1991 7 p Filed 14 Sep. 1990
(AD-D015223; US-Patent-5,028,864; US-Patent-Appl-SN-582277; US-Patent-Class-324-77) Avail: US Patent and Trademark Office

A common-path interferometric acoustic-optic heterodyne spectrum analyzer is presented. The spectrum analyzer is characterized by having high immunity to ambient vibration and makes use of two counter-propagating beams, two Bragg cells for beam diffraction, a series of waveplates, and a birefringent quartz wedge. Proper light polarization with the waveplates and Bragg cell geometry allows one Bragg cell to diffract primarily the clockwise beam and the other Bragg cell to diffract the counterclockwise beam. The birefringent quartz wedge shifts the diffracted beams to provide a heterodyne signal with a non-zero IF carrier frequency. The analyzer is highly angle compensated and alignment stable when components are disturbed in position or orientation. GRA

N92-28011# Naval Submarine Medical Research Lab., Groton, CT.
NARROWBAND AND BROADBAND ENVELOPE CUES FOR AURAL CLASSIFICATION
Thomas E. Hanna and Yvonne R. Masakowski 12 Jul. 1991 17 p
(DA Proj. RR0-4209)
(AD-A248693; NSMRL-1171) Avail: NTIS HC/MF A03

Auditory classification of a set of brief sounds was compared to that in a number of conditions that manipulated the spectral and temporal information in the signal. Multidimensional scaling techniques identified the use of six perceptual dimensions that could be accounted for by amplitude-envelopes of critical-band filtered signals. Modulation rates above 200 Hz did not contribute much to classification although there was some suggestion that rates greater than 200 Hz were significant for one of the dimensions. These results indicate the potential importance of envelope information for auditory classification of brief sounds. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

N92-27210# Florida Agricultural and Mechanical Univ., Tallahassee. Dept. of Physics.
ELECTRON INTERACTIONS WITH NON-LINEAR POLYATOMIC MOLECULES AND THEIR RADICALS AND IONS Interim Report, 7 Jun. 1990 - 6 Jun. 1991
Ashok K. Jain Jun. 1991 119 p
(Contract F33615-90-C-2032)
(AD-A246492; WL-TR-91-2074) Avail: NTIS HC/MF A06

The low energy electron collisions with CH4, SiH4, H2O, NH3, and GeH4 has been studied for elastic and rotational excitation channels. A parameter-free ab initio approach is employed in which electron-exchange interaction is treated exactly and the polarization effects via perturbation theory. The integro differential coupled equations are solved iteratively to yield scattering parameters. Detailed results are obtained for differential, integral, and momentum transfer cross sections. The agreement with experimental data for all the parameters is very good. The overall goal of this project is to develop state of the art computer programs and to perform calculations on various elastic and inelastic cross sections for low energy electron collisions with nonlinear polyatomic molecules and their ions and radicals. It is a well known fact that such a project involves a large amount of computing because of complexities involved in the dynamics of the collision system. Our main purpose is to produce a reliable set of useful cross section data for elastic as well as inelastic processes without involving any fitting procedure. When electrons interact with neutral molecular targets, time considerations of the electronic and nuclear motions allow us to treat rotational, vibrational, and electronic processes rather independently. GRA

N92-27351# Texas A&M Univ., College Station. Dept. of Chemistry.
MACROCYCLES CONTAINING TIN Final Report
Martin Newcomb 31 Dec. 1991 6 p
(Contract N00014-89-J-1214)
(AD-A246866) Avail: NTIS HC/MF A02

A summary of project results is reported. The project involved the development of methods for the synthesis, purification and characterization of pre-organized macromolecular hosts containing several Lewis acidic tin atoms, and investigations of the potential for such compounds to bind anions and basic donors selectively. The rationale for the study was that macrocyclic species containing Lewis acidic sites should bind anions and donors within the cavity of the macrocycle in a manner analogous to cation binding by crown ethers and cryptands, and that coordinatively saturated tin atoms, which can become pentacoordinate, are good candidates for the Lewis acids. Selective binding properties that correlate to the fit of an anion or donor in the organized binding region of the macromolecular host were expected, and such properties might be exploited for anion separation, anion identification, and catalysis. GRA

N92-27396# Wisconsin Univ., Madison.
SPECTROSCOPY, REACTION, AND PHOTODISSOCIATION IN HIGHLY VIBRATIONALLY EXCITED MOLECULES
1991 25 p
(Contract DE-FG02-86ER-13500)
(DE92-010651; DOE/ER-13500/3) Avail: NTIS HC/MF A03

Highly vibrationally excited molecules often control the course of chemical reactions in the atmosphere, combustion, plasmas, and many other environments. The research described in this Progress Report uses laser excitation and interrogation techniques to study and control the dynamics of highly vibrationally excited molecules. In particular, they show that it is possible to unravel the details and influence the course of photodissociation and bimolecular reaction. The experiments use laser excitation of overtone vibrations to prepare highly vibrationally excited molecules, frequently with single quantum state resolution, and laser spectroscopy to monitor the subsequent behavior of the excited molecule. We have studied the vibrationally mediated photodissociation and the bond- and state-selected bimolecular reaction of highly vibrationally excited molecules. In the first process, one photon creates a highly excited molecule, a second photon from another laser dissociates it, and light from a third laser detects the population of individual product quantum states. This approach allows us to explore otherwise inaccessible regions of the ground and excited state potential energy surface and, by exciting to the proper regions of the surface, to control the breaking of a selected chemical bond. In the second process, the highly vibrationally excited molecule reacts with an atom formed either in a microwave discharge or by photolysis and another laser interrogates the products. We have used this approach to demonstrate mode- and bond-selected bimolecular reactions in which the initial excitation controls the subsequent chemistry. DOE

N92-27421# Bonn Univ. (Germany, F.R.). Inst. fuer Physik.
THE NEUTRON-DEUTERON IN HYPERSPHERICAL FORMALISM Thesis [DAS NEUTRON-DEUTERON-PROBLEM IM HYPERSPHAERISCHEN FORMALISMUS]
Michael Decker Apr. 1991 48 p In GERMAN; ENGLISH summary
(Bonn-IR-91-13; ISSN-0172-8741; ETN-92-90834) Avail: NTIS HC/MF A03

The neutron, deuteron problem is examined in hyperspherical coordinates, using the Malfliet Tjon potentials. The Schroedinger equation is solved by expanding the three body wave function to surface functions. The triton binding energy and the elastic

scattering parameters are calculated. Results obtained are presented and evaluated. A short description is given of the numerical processes which are used to solve the problem. ESA

N92-27498# Instituto de Fisica Teorica, Sao Paulo (Brazil).
THE CORNWALL-NORTON MODEL IN THE STRONG COUPLING REGIME
A. A. Natale 1991 15 p
(DE92-621061; IFT-P-002/91) Avail: NTIS HC/MF A03

The Cornwall-Norton model is studied in the strong coupling regime. It is shown that the fermionic self-energy at large momenta behaves as Sigma(p) is approximately equal to (m(exp 2)/p) ln(p/m). We verify that in the strong coupling phase the dynamically generated masses of gauge and scalar bosons are of the same order, and the essential features of the model remain intact. DOE

N92-27691# Victoria Univ. (British Columbia). Dept. of Physics.
BOSE-EINSTEIN CORRELATIONS IN PROTON-ANTIPROTON COLLISIONS AT SQUARE ROOT OF s EQUALS 200 TO 900 GeV Ph.D. Thesis
Margret Fincke-Keeler Apr. 1989 111 p
(ISBN-0-315-50129-4; CTN-92-60487) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Bose-Einstein correlations have been measured at the super proton synchrotron (SPS) collider at center of mass energies from square root s = 200 to 900 giga electron volts. The size and the incoherence parameter of the particle emitting region have been determined as a function of charged particle density in pseudorapidity Delta n/Delta eta, center of mass energy and the direction of emission of the charged particles. For fixed values of Delta n/Delta eta the size of the interaction region and the incoherence parameter remain constant with rising square roots. At fixed square root the size of the interaction region increases with rising charged particle density, while there is some evidence that the incoherence parameter decreases with rising Delta n/Delta eta. Within a pseudorapidity interval of absolute eta less than 3 the size of the interaction region does not depend significantly on the direction of emission of particles. The incoherence parameter decreases slightly with increasing pseudorapidity of the secondaries. Author (CISTI)

N92-28008# Miami Univ., Oxford, OH. Dept. of Chemistry.
GAS-PHASE REACTIONS OF SILVER CLUSTER IONS PRODUCED BY FAST ATOM BOMBARDMENT Technical Report, 1 Jul. 1990 - 31 Dec. 1991
Carolyn J. Cassady and Paul Sharpe 26 Mar. 1992 20 p
(Contract N00014-90-J-1989)
(AD-A248401; TR-2) Avail: NTIS HC/MF A03

Silver cluster ions, Ag(sub x)(+) (x = 1-16), have been produced by fast atom bombardment of silver foil and silver salts in the external ion source of a Fourier transform ion cyclotron resonance mass spectrometer. Ion formation and collision-induced dissociation are discussed in relation to ion stabilities. Reactions of Ag(sub x)(+), x = 1-5, were studied with a variety of small molecules. Reactivity is dominated by adduct formation and silver atom displacement, which is dependent on cluster size. Contrasting reactivity was observed between Ag(+) and Ag(sub 2)(+) with 2-propanol, 2-methyl-2-propanol, and 2-methylpropane. GRA

N92-28047# California Univ., Berkeley. Lawrence Berkeley Lab.
SPECTROSCOPY OF TRANSIENT NEUTRAL SPECIES VIA NEGATIVE ION PHOTOELECTRON SPECTROSCOPY Ph.D. Thesis
A. Weaver Dec. 1991 312 p
(Contract DE-AC03-76SF-00098)
(DE92-011219; LBL-31877) Avail: NTIS HC/MF A14

Negative ion photoelectron spectroscopy has been used to study two types of transient neutral species: bound free radicals NO(sub 2) and NO(sub 3) and unstable neutral species (HI and FH sub 2). The negative ion time-of-flight photoelectron spectrometer used for these experiments is described in detail. DOE

N92-28105# Purdue Univ., West Lafayette, IN. Dept. of Chemistry.
ATOMIC-LEVEL STRUCTURE AND DYNAMICS OF ORDERED METAL ELECTRODES AS PROBED BY INFRARED SPECTROSCOPY AND SCANNING TUNNELING MICROSCOPY
Xudong Jiang and Michael J. Weaver 28 Feb. 1992 13 p
(Contract N00014-91-J-1409)
(AD-A246738; TR-119) Avail: NTIS HC/MF A03

Some recent applications of in-situ surface spectroscopy and scanning tunneling microscopy (STM) to the adsorption and reaction of small molecules on monocrystalline metal surfaces in electrochemical environments are outlined, with emphasis on the structural effects. Carbon monoxide adsorption and electrooxidation on low-index platinum, rhodium, and iridium surfaces in aqueous solutions as well as nonaqueous media are considered in comparison with the behavior of metal surfaces in ultrahigh vacuum. The combined use of FTIR and STM for the deduction of atomic-level CO adlayer structures is noted for Rh(111) and Rh(110). Real-time FTIR coupled with simultaneous or parallel voltammetric measurements yields molecule-specific information concerning the electrooxidation mechanisms of several small organic molecules on various low index platinum, rhodium, and bismuth-modified platinum surfaces. The acquisition of structural and dynamical information for potential-induced surface reconstruction on low index gold electrodes by means of atomic resolution STM is also outlined. GRA

N92-27225*# Los Alamos National Lab., NM. Space Science and Technology Div.
RADIOACTIVITIES INDUCED IN SOME LDEF SAMPLES Abstract Only
Robert C. Reedy and Calvin E. Moss *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 11 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27226*# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering Div.
A PHOTON-PHREAK DIGS THE LDEF HAPPENING Abstract Only
Alan R. Smith and Donna L. Hurley *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 12 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27228*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
INDUCED ACTIVATION STUDY OF LDEF Abstract Only
B. A. Harmon, G. J. Fishman, T. A. Parnell, and C. E. Laird (University of Eastern Kentucky, Richmond.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 14 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27229*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
REVISED PREDICTIONS OF LDEF EXPOSURE TO TRAPPED PROTONS Abstract Only
J. W. Watts, Jr., T. W. Armstrong, and B. L. Colborn (Science Applications International Corp., Prospect, TN.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 15 (For primary document see N92-27218 18-99)
(Contract NAS8-38566)
Avail: NTIS HC/MF A07

N92-27230*# Aerospace Corp., Los Angeles, CA. Space and Environment Technology Center.
MEASUREMENTS OF THE RADIATION DOSE TO LDEF BY MEANS OF PASSIVE DOSIMETRY Abstract Only
J. B. Blake and S. S. Imamoto *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 16 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27231*# Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France).
LDEF: DOSIMETRIC MEASUREMENT RESULTS (AO 138-7 EXPERIMENT) Abstract Only
J. Bourrieau *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 17 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27232*# Eril Research, Inc., San Rafael, CA.
ABSORBED DOSE MEASUREMENTS AND PREDICTIONS ON LDEF Abstract Only
A. L. Frank, E. V. Benton, T. W. Armstrong, and B. L. Colborn (Science Applications International Corp., Prospect, TN.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 18 (For primary document see N92-27218 18-99)
(Contract NAS8-38610)
Avail: NTIS HC/MF A07

N92-27233*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
CHARGE, ENERGY, AND LET SPECTRA MEASUREMENTS OF CHARGED PARTICLES IN P0006 EXPERIMENT OF LDEF Abstract Only
E. V. Benton, I. Csige, K. Oda, R. P. Henke, A. L. Frank, E. R. Benton, L. A. Frigo (San Francisco Univ., CA.), T. A. Parnell, J. W. Watts, Jr., and J. H. Derrickson *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 19 (For primary document see N92-27218 18-99)
(Grant NAG8-168)
Avail: NTIS HC/MF A07

N92-27234*# Eril Research, Inc., San Rafael, CA.
LIGHT-HEAVY ION MEASUREMENTS IN CR-39 LOCATED ON THE EARTH SIDE OF LDEF Abstract Only
I. Csige, E. V. Benton, and S. Soundararajan *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 20 (For primary document see N92-27218 18-99)
(Contract NAS8-38610)
Avail: NTIS HC/MF A07

N92-27235*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THREE-DIMENSIONAL SHIELDING EFFECTS ON CHARGED PARTICLE FLUENCES MEASURED IN THE P0006 EXPERIMENT IN LDEF Abstract Only
I. Csige, E. V. Benton, L. Frigo, T. A. Parnell, J. W. Watts, Jr., T. W. Armstrong, and B. L. Colborn (Science Applications International Corp., Prospect, TN.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 21 (For primary document see N92-27218 18-99)
(Grant NAG8-168)
Avail: NTIS HC/MF A07

N92-27236*# Science Applications International Corp., Prospect, TN.
DEVELOPMENT AND APPLICATION OF A 3-D GEOMETRY/MASS MODEL FOR LDEF SATELLITE IONIZING RADIATION ASSESSMENTS Abstract Only
B. L. Colborn and T. W. Armstrong *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 22 (For primary document see N92-27218 18-99)
(Contract NAS8-38566)
Avail: NTIS HC/MF A07

N92-27237*# Science Applications International Corp., Prospect, TN.
RADIATION MODEL PREDICTIONS AND VALIDATION USING LDEF DATA Abstract Only
T. W. Armstrong and B. L. Colborn *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 23 (For primary document see N92-27218 18-99)
(Contract NAS8-38566)
Avail: NTIS HC/MF A07

N92-27238*# Grumman Space Station, Huntsville, AL.
CRITICALITY OF Be-7 CONCENTRATION IN LDEF Abstract Only
Poh Shien Young *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 24 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27239*# Alabama Univ., Huntsville. Dept. of Chemistry.
COSMOGENIC RADIOISOTOPES ON LDEF SURFACES Abstract Only
J. C. Gregory, A. Albrecht, G. Herzog, J. Klein, and R. Middleton (Pennsylvania Univ., Philadelphia.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 25 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27240*# Naval Research Lab., Washington, DC. Center for Space Research.
HEAVY IONS IN SPACE (HIIS) EXPERIMENT Progress Report Abstract Only
James H. Adams, Jr., Lorraine P. Beahm, and Allan J. Tylka *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 26 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27242*# Science Applications International Corp., Prospect, TN.
FUTURE DIRECTIONS FOR LDEF IONIZING RADIATION MODELING AND ASSESSMENTS Abstract Only
T. W. Armstrong and B. L. Colborn *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 28 (For primary document see N92-27218 18-99)
(Contract NAS8-38566)
Avail: NTIS HC/MF A07

N92-27284*# Manchester Univ. (England). Dept. of Geology.
OXYGEN ISOTOPES IMPLANTED IN THE LDEF SPACECRAFT Abstract Only
J. M. Saxton, I. C. Lyon, E. Chatzitheodoredis, J. D. Gilmour, and G. Turner *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 78 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27301*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ANGULAR DISTRIBUTIONS OF 5eV ATOMIC OXYGEN SCATTERED FROM SOLID SURFACES ON THE LDEF SATELLITE Abstract Only
John C. Gregory (Alabama Univ., Huntsville.) and Palmer N. Peters *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 95 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27302*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
INTERACTION OF ATOMIC OXYGEN WITH THIN FILM AND BULK COPPER: AN XPS, AES, XRD, AND PROFILOMETER STUDY Abstract Only
Genesh N. Raikar, John C. Gregory, Ligia C. Christl (Alabama Univ., Huntsville.), and Palmer N. Peters *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 96 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27329*# Hulburt (E. O.) Center for Space Research, Washington, DC.
FUTURE RADIATION MEASUREMENTS IN LOW EARTH ORBIT Abstract Only
James H. Adams, Jr. *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 130 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

N92-27413# Stanford Linear Accelerator Center, CA.
SIMULATION OF TAIL DISTRIBUTIONS IN ELECTRON-POSITRON CIRCULAR COLLIDERS
J. Irwin Feb. 1992 8 p Presented at the 3rd Advanced Inertial Confinement Fusion Accelerator Beam Dynamics Workshop: Beam-Beam Effects in Circular Colliders, Novosibirsk, USSR, 20 May - 3 June. 1989
(Contract DE-AC03-76SF-00515)
(DE92-010743; SU-SLAC-PUB-5743; CONF-890594-6) Avail: NTIS HC/MF A02

In addition to the Gaussian shaped core region, particle bunches in electron-positron circular colliders have a rarefied halo region of importance in determining beam lifetimes and backgrounds in particle detectors. A method is described which allows simulation of halo particle distributions. DOE

N92-28045# Stanford Linear Accelerator Center, CA.
SLAC WORKSHOP ON HIGH ENERGY ELECTROPRODUCTION AND SPIN PHYSICS
1992 530 p Presented at the Stanford Linear Accelerator Center Workshop on High Energy Electroproduction and Spin Physics, Stanford, CA, 5-8 Feb. 1992
(Contract DE-AC03-76SF-00515)
(DE92-011077; SU-SLAC-392; CONF-920266) Avail: NTIS HC/MF A23

These Proceedings contain copies of the transparencies presented at the Workshop on High Energy Electroproduction and Spin Physics held at SLAC on February 5 to 8, 1992. The purpose of this Workshop was to bring people together to discuss the possibilities for new experiments using the SLAC high intensity electron and photon beams and the facilities of End Station A. DOE

N92-28174# Stanford Linear Accelerator Center, CA.
AMPLIFICATION AND DAMPING OF SYNCHROTRON OSCILLATIONS VIA A PARAMETRIC PROCESS
J. D. Fox and P. Corredoura Mar. 1992 4 p Presented at the 3rd European Particle Accelerator Conference, Berlin, Germany, 24-28 Mar. 1992
(Contract DE-AC03-76SF-00515)
(DE92-010748; SU-SLAC-PUB-5769; CONF-920315-8) Avail: NTIS HC/MF A01

A two-channel mode based feedback system for the control of barycentric and (pi) mode synchrotron oscillations in the Stanford Linear Collider damping rings is presented. This system uses a parametric amplifier/damper to control the (pi) mode and does not require a wideband RF cavity to drive the two bunches. Laboratory results from the SLC are presented which show amplification or damping of (pi) mode oscillations with 100-400 microns amplitude time constants. DOE

74 OPTICS

Includes light phenomena; and optical devices.
For lasers see *36 Lasers and Masers.*

N92-27338# Naval Postgraduate School, Monterey, CA.
LOCAL AREA NETWORKS WITH FIBER OPTICS M.S. Thesis
Gary Edwards Jun. 1991 79 p
(AD-A247033) Avail: NTIS HC/MF A05

Today's LANs are governed by two sets of standards. First, the IEEE 802 standards address the needs of low and medium speed LANs employing twisted pair and coaxial cable mediums. Second, the Fiber Distributed Data Interface (FDDI) standard addresses the needs of high-speed LANs for backbone connectivity using optical fibers. This thesis examines both sets of standards along with their architecture with an emphasis placed on fiber optic. It is aimed to provide the reader with introductory and tutorial materials and function as a primary reference for those who need an understanding of the technology. GRA

N92-27365# Lawrence Livermore National Lab., CA.
SIMPLE-REVERSIBLE FIBER-OPTIC CHEMICAL SENSORS USING SOLVATOCHROMIC DYES
S. M. Angel, B. L. Anderson, and K. Langry Jan. 1992 12 p Presented at the SPIE Meeting, Boston, MA, 3-6 Sep. 1991
(Contract W-7405-eng-48)
(DE92-010441; UCRL-JC-108207; CONF-9109230-14) Avail: NTIS HC/MF A03

There are many environmental and process-control sensor applications where speed and reversibility are more important than selectivity. These might include, monitoring the fate and transport of contaminants in laboratory columns and microcosms, measuring hydrocarbons in waste treatment streams, mapping the extent of a plume of a known contaminant, or monitoring solvent concentrations (e.g., acetone, dichloromethane (DCM)) in a manufacturing process stream. In each case, there is prior knowledge of the type of contaminant and interferences, and in many cases the target molecule is at a relatively high concentration. For such applications, the sensor should be fast and reversible to allow real-time tracking of rapidly changing concentrations; however, it does not need to be very selective and might even respond to a wide variety of compounds. We are exploring new types of sensors for these applications. The sensors are based on reversible color changes that occur when solvatochromic (SV) dyes experience polarity changes. The optical sensors are made by immobilizing the SV dye in a polymer film that is coated on the end of a clad optical fiber or on the sides (i.e., evanescent region) of an unclad optical fiber. For the sensors described here interaction of a fluorescent SV dye with analyte vapors changes the amount of light absorbed by the dye and thus the fluorescence intensity that is measured with the optical fiber. Initial experiments have focused on the fuel-related contaminants (e.g., xylene, benzene), and commercial solvents (e.g., acetone, DCM). This paper will focus on the xylene and DCM results. DOE

N92-27373 Department of the Navy, Washington, DC.
HIGH PRESSURE FIBER OPTIC CONNECTOR PLUG Patent
Roger L. Morency, inventor (to Navy) and Gerald E. Holmberg, inventor (to Navy) 12 Nov. 1991 7 p Filed 7 Dec. 1990
(AD-D015246; US-Patent-5,064,268; US-Patent-Appl-SN-625720; US-Patent-Class-387-87) Avail: US Patent and Trademark Office

A fiber optic cable connection for high pressure environments utilizes a fiber optic cable having (1) a multiplicity of fiber optic strands, extending axially therein, (2) a strength member extending axially in spaced relationship thereabout, (3) an outer jacket, and

(4) a filler matrix within the strength member and in which the strands are encased, a precision connector with an inner face having an axially extending from the transverse wall of the recess to the outer face of the connector member and through which the fiber optic strands extend. A preload insert member is disposed about the strands with its outer end extending into the recess of the connector and a peripheral shoulder abutting the inner face of the connector member. A body member is disposed about the insert member and has its outer end extending over the inner end portion of the connector. GRA

N92-27419# Stanford Linear Accelerator Center, CA.
PERTURBATION THEORY IN LIGHT-CONE QUANTIZATION Ph.D. Thesis
A. Langnau Jan. 1992 132 p
(Contract DE-AC03-76SF-00515)
(DE92-011076; SU-SLAC-385) Avail: NTIS HC/MF A07

A thorough investigation of light-cone properties which are characteristic for higher dimensions is very important. The easiest way of addressing these issues is by analyzing the perturbative structure of light-cone field theories first. Perturbative studies cannot be substituted for an analysis of problems related to a nonperturbative approach. However, in order to lay down groundwork for upcoming nonperturbative studies, it is indispensable to validate the renormalization methods at the perturbative level, i.e., to gain control over the perturbative treatment first. A clear understanding of divergences in perturbation theory, as well as their numerical treatment, is a necessary first step towards formulating such a program. The first objective of this dissertation is to clarify this issue, at least in second and fourth-order in perturbation theory. The work in this dissertation can provide guidance for the choice of counterterms in Discrete Light-Cone Quantization or the Tamm-Dancoff approach. A second objective of this work is the study of light-cone perturbation theory as a competitive tool for conducting perturbative Feynman diagram calculations. Feynman perturbation theory is the most practical tool for computing cross sections in high energy physics and other physical properties of field theory. Although this standard covariant method is applied to a great range of problems, computations beyond one-loop corrections are very difficult. Because of the algebraic complexity of the Feynman calculations in higher-order perturbation theory, it is desirable to automatize Feynman diagram calculations so that algebraic manipulation programs can carry out almost the entire calculation. This thesis presents a step in this direction. The technique we are elaborating on here is known as light-cone perturbation theory. DOE

N92-27435# Naval Postgraduate School, Monterey, CA.
DESIGN AND IMPLEMENTATION OF A FIBER OPTIC TOKEN-RING LOCAL AREA NETWORK M.S. Thesis
Gary Bibeau Dec. 1991 69 p
(AD-A245364) Avail: NTIS HC/MF A04

This thesis describes the design and implementation of a fiber optic token-ring local area network (LAN). This design features fiber optic channels between stations on the network without the use of a wiring concentrator. The initial LAN electrical signal operating at 4 Mbps was provided by a LAN adapter card based on the TMS380 chipset developed for twisted pair copper wire. Since the physical characteristics of fiber and wire vary, use of this adapter necessitated that the design be able to deceive system initialization diagnostics and continuity checks designed for a wire system. Successful LAN communications over the fiber optic channels are described. Author (GRA)

N92-27595# Stanford Univ., CA. Dept. of Electrical Engineering.
STARNET: AN INTEGRATED SERVICES BROADBAND OPTICAL NETWORK WITH PHYSICAL STAR TOPOLOGY
P. Poggiolini and L. Kazovsky 1991 16 p
(Contract N00014-91-J-1857)
(AD-A247555) Avail: NTIS HC/MF A03

We propose a new broadband local area network, STARNET, based on a physical passive star topology. STARNET implements both a packet network and a highspeed WDM circuit interconnect, which are simultaneously available to every node of the network and operate independently. As a result, STARNET supports very diverse types of traffic in an optimal way. Each node requires only two lasers and its structure permits one to effectively achieve frequency stabilization for the whole network. An effort toward an experimental demonstration of a 4-node, 3 Gbit/s per node, FDDI-compatible (at the packet network level) STARNET is currently in progress at Optical Communication Research Laboratory, Stanford University. GRA

N92-27596# Stanford Univ., CA. Dept. of Electrical Engineering.
MINIMUM POLARIZATION MODULATION: A HIGHLY BANDWIDTH EFFICIENT COHERENT OPTICAL MODULATION SCHEME
S. Benedetto, L. Kazovsky, and P. Poggiolini 1991 10 p
(Contract N00014-91-J-1857)
(AD-A247556) Avail: NTIS HC/MF A02

We propose and analyze a novel binary coherent optical transmission scheme based on continuous polarization modulation. Its bandwidth efficiency is better than that of both PSK and MSK. The signal spectrum is independent of the polarization transformations along the fiber. Its phase-noise tolerance is similar to FSK and its sensitivity is 3 dB better than that of single-filter FSK. GRA

N92-27597# Stanford Univ., CA. Dept. of Electrical Engineering.
SUBCARRIER-MULTIPLEXED COHERENT OPTICAL VIDEO TRANSMISSION USING DIRECT FREQUENCY MODULATION OF SEMICONDUCTOR LASERS
J. C. Fan and L. G. Kazovsky 1991 15 p
(Contract N00014-91-J-1857)
(AD-A247618) Avail: NTIS HC/MF A03

An analog subcarrier-multiplexing (SCM) coherent optical system for video transmission using direct frequency modulation of semiconductor lasers is analyzed. Receiver sensitivity, corresponding to a 56 dB SNR at the output video ports, is approximately -38 dBm for 50 channels and -25 dBm for 100 channels using the FM subcarrier modulation format. These results are obtained for realistic values of receiver thermal noise (3.31 x 10 exp -22 sq A/Hz), laser linewidth (40 MHz), RIN(-150 dB/Hz), and optical bandwidth (20 GHz). Linewidth-induced performance degradation is found to be negligible for up to 50 channels. GRA

N92-27599# National Inst. of Standards and Technology, Gaithersburg, MD.
DIAMOND AS AN OPTICAL MATERIAL Interim Report
A. Feldman, E. N. Farabaugh, L. H. Robins, and D. Shechtman 20 Feb. 1992 26 p
(Contract N00014-90-F-0011)
(AD-A247628; TR-12) Avail: NTIS HC/MF A03

CVD diamond, which is mainly polycrystalline, exhibits several materials problems that limit its optical transmission, such as scattering due to large surface roughness and absorption due to defects, nondiamond carbon phases, and impurities. Optical spectroscopy, Raman spectroscopy, cathodoluminescence imaging and spectroscopy, and high resolution electron microscopy are used to examine the defects in the material; however, a relationship between observed defects and optical absorption is not always evident. New polishing methods are promising an ability to produce smooth surfaces in reasonable polishing times. GRA

N92-27608# Stanford Univ., CA. Space Telecommunications and Radioscience Lab.
SPACE-DIVISION OPTICAL SWITCHES BASED ON SEMICONDUCTOR OPTICAL AMPLIFIERS
Robert F. Kalman, Leonid G. Kazovsky, and Joseph W. Goodman 1991 6 p
(Contract N00014-91-J-1857)
(AD-A247616) Avail: NTIS HC/MF A02

Benes and distributed gain matrix-vector multiplier (MVM) switches larger than 10 exp 10 x 10 exp can, in principle, be achieved by using semiconductor optical amplifiers (SOA's). In contrast, lumped gain SOA-based MVM switches are limited in size to less than 100 x 100. GRA

N92-27616 Department of the Navy, Washington, DC.
HETEROSTRUCTURE DEVICE USEABLE AS A FAR INFRARED PHOTODETECTOR Patent
Evan R. Glaser, inventor (to Navy) and Benjamin V. Shanabrook, inventor (to Navy) 5 Nov. 1991 6 p Filed 15 Nov. 1988
(AD-D015217; US-Patent-5,063,419; US-Patent-Appl-SN-271546; US-Patent-Class-357-16) Avail: US Patent and Trademark Office

A semiconductor heterostructure is useful as a photodetector in the far infrared. The barrier layers of the heterostructure are doped so that charge carriers migrate from the energy bands of the barrier layers towards the energy bands of the quantum wells, but remain weakly bound to the doping impurities in the barrier layers. Because of weak residual bonding, the energy necessary to raise these electrons fully into the quantum wells' energy band is significantly reduced, extending the lower frequency range at which such devices are useful as photodetectors. Selection of several of the heterostructure's dimensions determine the impurities resonant absorption frequency, and application of an electric or magnetic field shifts the well's resonant absorption frequency, in effect frequency fine tuning the heterostructure. GRA

N92-27625# Waterloo Univ. (Ontario).
THEORY OF MULTILAYER DIELECTRIC PLANAR WAVEGUIDES AND ITS APPLICATIONS Ph.D. Thesis
Yi-Fan Li 1989 340 p
(ISBN-0-315-49255-4; CTN-92-60475) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Guiding properties of multi-layer dielectric planar waveguides were studied theoretically in detail. First, the fundamental propagation constants (through the eigenvalue equation) and the field distributions have been obtained, such as the fictitious half phase shifts, and the amplitudes of the evanescent waves, were explored. Other key parameters in a multi-layer waveguide, such as mode number, power flow, stored energy, group velocity and group index were investigated. In order to accomplish this, the concepts of effective guide thickness and transit time were extended from a three-layer waveguide to a general multi-layer planar waveguide. A new concept, the effective layer thickness, is introduced. In terms of these parameters, power flow, stored energy, and group index can be expressed in very simple forms, leading to direct physical explanations. Formulas describing the generalized dispersion properties for both the TE modes and the TM modes in multi-layer planar waveguides were obtained. The results form a self-consistent theory of multi-layer dielectric planar waveguides, and the theory is applied to special cases such as three layer, four layer, and symmetrical five layer waveguides. The mode-filtering characteristics of the W-structure waveguide were studied in detail, and some criteria for designing this type of mode filter are presented. Author (CISTI)

N92-27716# University of Southern California, Los Angeles. Dept. of Physics.
STIMULATED SCATTERING AND PHASE CONJUGATION IN PHOTOREFRACTIVE MATERIALS Final Report, 1 Aug. 1988 - 30 Sep. 1991
Jack Feinberg 31 Jan. 1992 129 p
(Contract F49620-88-C-0095)
(AD-A246903; AFOSR-92-0013TR) Avail: NTIS HC/MF A07

Applications and properties of nonlinear optical materials were studied, especially photorefractive crystals. A summary includes eight areas of inquiry: (1) demonstration of a new technique for seeing an object buried in or behind a scattering medium using time-resolved holography in a spectral hole-burning material; (2) demonstration of an all-optical switchboard using stimulated, mutually-pumped phase conjugation in a photorefractive crystal; (3) use of optical novelty filters to detect small changes in an optical scene; (4) invention of an electric field correlator to measure the coherence length of picosecond laser pulses, using two-wave mixing in a photorefractive crystal; (5) derivation of a theory of beam coupling and pulse shaping picosecond light pulses in photorefractive crystals; (6) development of a new, multiple level model to explain the nonlinear photoconductivity of barium titanate crystals; (7) investigation of the role of absorption gratings in beam coupling in barium titanate crystals and showing how these gratings can conveniently be used to determine the density of charge in these crystals; and (8) explanation of how stimulated processes cause the curved beam paths observed in mutually-pumped and self-pumped phase conjugators. GRA

N92-27720# Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.
SCANNING TUNNELING MICROSCOPY OF THE ORGANIC CONDUCTORS (TMTSF)2X(X = C1O4-, REO4-)
Shulong Li, Henry S. White, and Michael D. Ward 25 Feb. 1992 33 p
(Contract N00014-91-J-1927)
(AD-A246909; TR-11-ONR) Avail: NTIS HC/MF A03

Scanning tunneling microscopy (STM) images of the (001) face (ab face) of the organic conductors (TMTSF)2X (TMTSF = tetramethyl tetra selenafulvalene; X = ClO4(-), ReO4(-)) reflect the surface molecular corrugation and anisotropic stacking of TMTSF molecules along the zone axes (100) direction. The lattice constants of the (001) face determined from STM for(TMTSF)2ClO4 are a = 7.3+/-0.2 A, b = 7.8+/-0.2 A, and gamma = 69.5 deg +/-2 deg, and for (TMTSF)2ReO4 are 7.5+/-0.2 A, b = 8.1+/-0.2 A, and gamma = 70 deg +/-2 deg, in excellent agreement with the known crystal structure. Height profile analysis of the tunneling current assigned to localized TMTSF electronic states are in agreement with the angle between the (001) face and the direction of the short axis of the TMTSF molecules. The STM images also are consistent with the high degree of electronic anisotropy of (TMTSF)2ClO4, with a broad electronic state density associated with the pseudo one-dimensional TMTSF stacks and a highly localized state density associated with Se-Se contacts between stacks along the zone axes (110) direction. The results are corroborated by STM of isomorphous (TMTSF)2ReO4 which exhibits negligible tunneling current associated with the Se-Se states, in agreement with the slightly larger Se-Se interstack distances in this compound. The lack of tunneling current in the interstack region of (TMTSF)2ReO4 signifies reduced electronic interaction transverse to the stacking direction, consistent with previously reported electronic properties of (TMTSF)2ReO4. GRA

N92-27756# Duke Univ., Durham, NC.
NONLINEAR OPTICS IN DENSE FREQUENCY NARROW SUPERSONIC BEAMS Final Report, Apr. 1988 - Dec. 1990
John E. Thomas Dec. 1991 33 p
(Contract F19628-88-K-0012)
(AD-A246647; RL-TR-91-317) Avail: NTIS HC/MF A03

A broad program of research was undertaken to develop novel magnetically compensated supersonic beams and to study the interaction of light with these systems. The technique was demonstrated initially with strontium where a 50 percent absorption and 18 MHz linewidth was obtained using a transition with a 22 micro-sec radiative lifetime. The new method was then applied to observe continuous spatial photon echoes in samarium, which will have important applications in spatial phase conjugation and in nonlinear optical processing including optical field spatial convolution and correlation. In addition to this research, the use of a magnetic field gradient in the magnetic compensation method led to the development of novel Raman induced resonance imaging techniques for moving atoms in beams. The method can achieve uncertainty limited spatial resolution in the nanometer region with wide applications in atomic optics, including interferometers, gyroscopes and ultrahigh resolution lithography. GRA

N92-27826# Spire Corp., Bedford, MA.
ADVANCED BAFFLE MATERIALS TECHNOLOGY DEVELOPMENT Final Report, Jun. 1987 - Sep. 1990
E. A. Johnson, C. J. VonBenken, W. D. Halverson, R. D. Evans, and J. S. Wollam Oct. 1991 97 p
(Contract DAAL04-87-C-0036)
(AD-A247935; FR-10106; MTL-TR-91-38) Avail: NTIS HC/MF A05

Optical sensors for strategic defense will require optical baffles to achieve adequate off-axis stray light rejection and pointing accuracy. Baffle materials must maintain their optical performance after exposure to both operational and threat environments. In addition, baffle materials must not introduce contamination which would compromise the system signal-to-noise performance or impair system mission readiness. Critical examination of failure mechanisms in current baffle materials are quite fragile and contribute to system contamination problems. Spire has developed technology to texture the substrate directly, thereby, removing minute, fragile interfaces subject to mechanical failure. This program has demonstrated that ion beam texturing produces extremely dark surfaces which are immune to damage from ordinary handling. This technology allows control of surface texture feature size and hence the optical wavelength at which the surface absorbs. The USAMTL/Spire program has produced dramatic improvements in the reflectance of ion beam textured aluminum without compromising mechanical hardness. In simulated launch vibration tests, this material produced no detectable contamination on adjacent catcher plates. GRA

N92-27838 Department of the Navy, Washington, DC.
FIBER-OPTIC REMOTE ANGULAR POSITION SENSOR INCLUDING A POLARIZATION TRACK Patent
Michael R. Brininstool, inventor (to Navy), Jeffrey T. Newmaster, inventor (to Navy), and Steven L. Garrett, inventor (to Navy) 17 Dec. 1991 11 p Filed 17 Sep. 1990
(AD-D015210; US-Patent-5,073,711; US-Patent-Appl-SN-583778; US-Patent-Class-250-231.18) Avail: US Patent and Trademark Office

A sensor for remotely detecting the angular position of a shaft that rotates within a frame is disclosed. The sensor is comprised of the following: (1) a means for generating collimated optical beams; (2) a means for receiving and combining the optical beams into a composite optical beam; and (3) a code wheel fixed to the shaft and interposed between the first and second means. The code wheel includes channel mask patterns and a first polarizing filter. Interaction between the code wheel and the light beams results in the composite light beam being encoded such that the angular position of the wheel is functionally related to the intensity of the composite optical beam. The sensor further includes a third means for providing an output corresponding to the angular position of the code wheel. Author (GRA)

N92-27871*# Alabama Univ., Huntsville. Center for Applied Optics.
GLASS SAMPLE PREPARATION AND PERFORMANCE INVESTIGATIONS Final Report, Apr. 1991 - Apr. 1992
R. Barry Johnson Apr. 1992 26 p
(Contract NAS8-36955)
(NASA-CR-190399; NAS 1.26:190399; UAH-5-32589) Avail: NTIS HC/MF A03

This final report details the work performed under this delivery order from April 1991 through April 1992. The currently available capabilities for integrated optical performance modeling at MSFC for large and complex systems such as AXAF were investigated. The Integrated Structural Modeling (ISM) program developed by Boeing for the U.S. Air Force was obtained and installed on two DECstations 5000 at MSFC. The structural, thermal and optical analysis programs available in ISM were evaluated. As part of the optomechanical engineering activities, technical support was provided in the design of support structure, mirror assembly, filter wheel assembly and material selection for the Solar X-ray Imager (SXI) program. As part of the fabrication activities, a large number of zerodur glass samples were prepared in different sizes and shapes for acid etching, coating and polishing experiments to characterize the subsurface damage and stresses produced by the grinding and polishing operations. Various optical components for AXAF video microscope and the x-ray test facility were also fabricated. A number of glass fabrication and test instruments such as a scatter plate interferometer, a gravity feed saw and some phenolic cutting blades were fabricated, integrated and tested. Author

N92-27873*# Tennessee Technological Univ., Cookeville. Center for Manufacturing Research and Technology Utilization.
REAL-VALUED COMPOSITE FILTERS FOR CORRELATION-BASED OPTICAL PATTERN RECOGNITION Final Report
P. K. Rajan and Anushia Balendra May 1992 147 p
(Grant NAG9-521)
(NASA-CR-190405; NAS 1.26:190405; TTU-124-894-83) Avail: NTIS HC/MF A07

Advances in the technology of optical devices such as spatial light modulators (SLMs) have influenced the research and growth of optical pattern recognition. In the research leading to this report, the design of real-valued composite filters that can be implemented using currently available SLMs for optical pattern recognition and classification was investigated. The design of real-valued minimum average correlation energy (RMACE) filter was investigated. Proper selection of the phase of the output response was shown to reduce the correlation energy. The performance of the filter was evaluated using computer simulations and compared with the complex filters. It was found that the performance degraded only slightly. Continuing the above investigation, the design of a real filter that minimizes the output correlation energy and the output variance due to noise was developed. Simulation studies showed that this filter had better tolerance to distortion and noise compared to that of the RMACE filter. Finally, the space domain design of RMACE filter was developed and implemented on the computer. It was found that the sharpness of the correlation peak was slightly reduced but the filter design was more computationally efficient than the complex filter. Author

N92-27920# Naval Oceanographic and Atmospheric Research Lab., Monterey, CA.
SPECIFICATION FOR A REFRACTIVITY STRUCTURE MATCHING ALGORITHM Final Report
Gerard N. Vogel Nov. 1991 38 p
(AD-A247439; AD-E040224; NOARL-TN-191) Avail: NTIS HC/MF A03

The Refractivity Structure Matching Algorithm (RSMA) is an automated aid for matching refractivity structure in adjacent profiles which result from common layers. The RMSA is specifically designed to prepare multiple refractivity profiles for entry into the Naval Ocean Systems Center's Radio Physical Optics (RPO) Program. A full description of the RMSA, a test case demonstrating its capabilities, and a computer listing, are provided in this document. GRA

N92-27999 Department of the Navy, Washington, DC.
BI-DIRECTIONAL OPTICAL TRANSMISSION SYSTEM FOR RF ELECTRICAL ENERGY Patent
Paul T. Bryant, inventor (to Navy), Joseph F. Weller, inventor (to Navy), and Lew Goldberg, inventor (to Navy) 19 Nov. 1991 6 p Filed 31 Jul. 1990
(AD-D015224; US-Patent-5,066,148; US-Patent-Appl-SN-560702; US-Patent-Class-385-24) Avail: US Patent and Trademark Office

A bi-directional optical transmission system for radio frequency electrical energy is comprised of first and second transmitter/receiver stations that transmit and receive light signals along an optical path. Each station has a laser transmitter for transmitting a carrier light beam that is intensity modulated by a synchronization of an input radio frequency electrical signal. A photodetector at each station detects the intensity variations of the carrier light beam from the other station and outputs a respective radio frequency electrical signal which is synchronized with the radio frequency electrical input signal of the other station.

A beam splitter is provided between the optical path at both the laser transmitter and photodetector to split the incident light beams into a pass portion and angularly reflected portion. An isolator device also is provided between the laser transmitter and beam splitter to isolate the laser transmitter from back reflections. Preferably, the isolator is a Faraday isolator, and additionally or alternatively the laser transmitters transmit at widely separate wavelengths. The optical path can either be free space or a main optical fiber, and the synchronization of the input radio frequency electrical energy can either be phase synchronization or time synchronization. GRA

N92-28001 Department of the Navy, Washington, DC.
ALL-OPTICAL FIBER FARADAY ROTATION CURRENT SENSOR WITH HETERODYNE DETECTION TECHNIQUE Patent
Alan D. Kersey, inventor (to Navy) 5 Nov. 1991 10 p Filed 14 Sep. 1990
(AD-D015226; US-Patent-5,063,290; US-Patent-Appl-SN-582274; US-Patent-Class-250-227.17) Avail: US Patent and Trademark Office

An all-optical-fiber Faraday effect sensor system for detecting electric current is discussed. The sensor system includes a source for providing an input beam of frequency-modulated linearly-polarized light and a polarization modulator for converting the input beam of frequency-modulated light into polarization-modulated light. A Faraday rotation current sensor passes the polarization-modulated light through a magnetic field generated by an electric current to be measured. The lines of force of the magnetic field are generally parallel to the direction of propagation of the polarization modulated light. A detector and signal processing is used to derive an electrical heterodyne carrier signal which is phase modulated by the electric current. Detection of the phase of this carrier is used to determine the magnitude of the electric current. GRA

N92-28007# Naval Research Lab., Washington, DC.
PROCEDURE FOR MEASURING RADIATION-INDUCED ATTENUATION IN OPTICAL FIBERS AND OPTICAL CABLES
E. J. Friebele 27 Mar. 1992 24 p
(AD-A248393; NRL/MR/6505-92-6963) Avail: NTIS HC/MF A03

This test procedure outlines methods for measuring both the steady state response of optical fibers and cables exposed to continuous radiation and the transient response of optical fibers and cables exposed to a pulse of radiation. It can be used to determine the level of radiation-induced attenuation produced in single-mode or multimode optical fibers, in either cabled or uncabled form. GRA

N92-28125# Washington Univ., Seattle. Dept. of Chemistry.
FLUCTUATIONS AND SQUEEZING IN RESONANCE FLUORESCENCE EMITTED NEAR A PHASE CONJUGATOR Interim Report
Henk F. Arnoldus and Thomas F. George Apr. 1992 15 p
(Contract N00014-90-J-1193)
(AD-A248735; WSU/DC/92-TR-83) Avail: NTIS HC/MF A03

Atomic resonance fluorescence, emitted near the surface of a four-wave mixing phase conjugator, exhibits squeezing for certain values of the optical parameters of the incident laser field and for a certain range of the phase-conjugate reflectivity. A condition for the occurrence of squeezing is derived, and it is shown that the presence of the phase-conjugating medium tends to increase the quantum fluctuations, thereby, diminishing the squeezing. GRA

N92-28181# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPMENT OF HIGH STABILITY ANALOG FIBER OPTIC LINKS Final Report, Sep. 1988 - Dec. 1990
Ronald T. Logan, Jr., George Lutes, Lori Primas, and Lute Maleki Dec. 1991 36 p
(Contract MIPR-FQ761900016; AF Proj. 4519)
(AD-A248594; RL-TR-91-383) Avail: NTIS HC/MF A03

This report summarizes the analysis and experiments which were conducted to identify sources of Close to Carrier (CTC) noise in semiconductor laser diodes. Following the initial experiments a set of criteria was established for a fiber optic system with improved noise. An analog microwave optical system was fabricated to verify the results of the study at a frequency of 8.1 GHz. The results show a CTC noise of -95 DBc/Hz from the 8.1 GHz carrier, well below the CTC noise of the best crystal oscillators. The report recommends that for improved RF phase stability in fiber optic links, greater than 60 dB isolation is recommended to protect the laser diode from reflection, less than 5mm separate the diode from the first optical reflection, and that the laser be temperature controlled to 0.1 C or better. GRA

N92-27295*# Calspan Corp., Arnold AFS, TN.
SPECTRAL INFRARED HEMISPHERICAL REFLECTANCE MEASUREMENTS FOR LDEF TRAY CLAMPS Abstract Only
Bobby E. Wood, Brian K. Cromwell, Charles W. Pender, and Seth D. Shepherd (Air Force Systems Command, Arnold AFS, TN.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 89 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27306*# Georgia Tech Research Inst., Atlanta.
DEGRADATION OF ELECTRO-OPTIC COMPONENTS ABOARD LDEF Abstract Only
M. D. Blue *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 102 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27307*# Phillips Lab., Kirkland AFB, NM.
DEGRADATION OF OPTICAL COMPONENTS IN A SPACE ENVIRONMENT Abstract Only
Linda L. DeHainaut, John Kenemuth, Cynthia E. Tidler, and David W. Seegmiller (Schafer, W. J. Associates, Inc., Albuquerque, NM) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 103 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27308*# TRW Space and Defense Sector, Redondo Beach, CA.
OPTICAL CHARACTERIZATION OF CONTAMINANT FILM Abstract Only
Brian K. Blakkolb, James Y. Yaung, Tom Kosic, and Howard Bowen (Hughes Aircraft Co., El Segundo, CA.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 104 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27309*# Paris XI Univ., Orsay (France). Inst. d'Astrophysique Spatiale.
IN ORBIT DEGRADATION OF UV OPTICAL COMPONENTS FOR THE WAVELENGTH RANGE 10-140 MICRONS. AO 138.3 (FRECOPA) Abstract Only
J. P. Delabouinere, C. Carabetian, and J. F. Hochedez *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 105 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27310*# Eastman Kodak Co., Rochester, NY.
EFFECTS OF LONG TERM SPACE ENVIRONMENT EXPOSURE ON OPTICAL SUBSTRATES AND COATINGS (S0050-2) Abstract Only
John Vallimont and Arthur Mustico *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 107 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27311*# Science Applications International Corp., Santa Monica, CA.
LDEF SPACE OPTICS HANDBOOK Abstract Only
Robert J. Champetier, Dale R. Atkinson, and William T. Kemp (Phillips Lab., Kirkland AFB, NM.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 108 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27314*# Phillips Lab., Kirkland AFB, NM. Space and Missiles Directorate.
CHARACTERIZATION OF A SPACE ORBITED INCOHERENT FIBER OPTIC BUNDLE Abstract Only
S. A. DeWalt and E. W. Taylor *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 111 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27315*# Phillips Lab., Kirkland AFB, NM. Space and Missiles Technology Directorate.
ANALYSIS OF SPACE ENVIRONMENT EFFECTS ON ACTIVE FIBER OPTIC LINKS ORBITED ABOARD THE LDEF Abstract Only
T. W. Monarski, J. N. Berry, A. D. Sanchez, R. J. Padden, S. P. Chapman, and E. W. Taylor *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 112 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27316*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIATION AND TEMPERATURE EFFECTS ON LDEF FIBER OPTIC CABLE SAMPLES Abstract Only
Alan R. Johnston, Ron Hartmayer, and Larry A. Bergman *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 113 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27326*# AZ Technology, Huntsville, AL.
NEXT GENERATION OPTICAL INSTRUMENTS AND SPACE EXPERIMENTS BASED ON THE LDEF THERMAL CONTROL SURFACES EXPERIMENT (S0069) Abstract Only
Donald R. Wilkes *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 127 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-28088# Rome Univ. (Italy). Dipartimento di Fisica.
NONLINEAR EFFECTS IN OPTICAL FIBERS
Bruno Crosignani *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 20 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-28089# Southampton Univ. (England). Optoelectronics Research Centre.
ACTIVE FIBRES AND OPTICAL AMPLIFIERS
David N. Payne *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 26 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-28090# McDonnell-Douglas Electronic Systems Co., Santa Ana, CA.
OPTICAL FIBER SENSORS
Eric Udd *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 18 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

N92-28091# Strathclyde Univ., Glasgow (Scotland). Smart Structures Research Inst.
SMART STRUCTURES: THE RELEVANCE OF FIBRE OPTICS
Brian Culshaw and Peter T. Gardiner *In* AGARD, Advances in Fibre-Optic Technology in Communications and for Guidance and Control May 1992 17 p (For primary document see N92-28084 18-32)
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N92-27330# California Univ., Berkeley. Electronics Research Lab.
PLASMA THEORY AND SIMULATION GROUP Annual Progress Report, 1 Jan. - 31 Dec. 1991
C. K. Birdsall 31 Dec. 1991 107 p
(Contract N00014-90-J-1198)
(AD-A246129) Avail: NTIS HC/MF A06
This brief progress report covers our research in general plasma theory and simulation, plasma-wall physics theory and simulation, and code development. Reports written in this period are included with this mailing. A publications list that includes abstracts from major meetings is presented. GRA

N92-27362# Oak Ridge National Lab., TN.
PHYSICS AND DIAGNOSTICS OF LASER ABLATION PLUME PROPAGATION FOR HIGH-(Tc) SUPERCONDUCTOR FILM GROWTH
D. B. Geohegan Mar. 1992 26 p Presented at the International Conference on Metallurgical Coatings and Thin Films, San Diego, CA, 6-10 Apr. 1992
(Contract DE-AC05-84OR-21400)
(DE92-009386; CONF-920439-3) Avail: NTIS HC/MF A03
The formation, composition, and propagation of laser-produced plasmas used for pulsed laser deposition (PLD) of YBa2Cu3O(7-x) were studied under film growth conditions. Four complementary spatially- and temporally-resolved in situ diagnostic techniques are applied to characterize the expansion of the laser plume into both vacuum and ambient gases: optical emission and absorption spectroscopy, fast ion probe measurements, and fast photography with a gated, image-intensified CCD array (ICCD) camera system. Transient optical absorption spectroscopy reveals large densities of ground state atoms, ions, and molecules in the plume as well as a slower component to the plume transport than is indicated by the plasma fluorescence and ion current. Ablation into background gases results in scattering attenuation of the laser plume. The exponential attenuation of the positive ion flux transmitted through 50-300 m Torr background oxygen is measured and used to define an overall ion-oxygen reaction cross section of sigma(sub (iota)-O2) = 2.3(10)(exp -16) sq cm under the described film growth conditions. The slowing of the laser plasma and formation of shock structures due to collisions with the ambient gas are described using ion probe measurements and ICCD photographic comparisons of expansion into vacuum and background oxygen. At the pressures used for PLD, distance-time (R-t) plots derived from the photographs and ion probe waveforms indicate that the higher pressure plume initially expands through the ambient gas in accordance with a drag model experiencing little slowing until a visible shock structure forms. Following a transition period, in which the plume appears to have two components, a single component shock structure propagates in better agreement with a shock, or blast wave model. DOE

N92-27446# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
TOKAMAK PROFILES BASED ON MODELS FOR THE ANOMALOUS ELECTRON THERMAL DIFFUSIVITY

Akira Hirose Dec. 1991 12 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-125; CTN-92-60499) Avail: NTIS HC/MF A03

A study is presented which examines whether any existing models for electron thermal diffusivity can reproduce, at least qualitatively, a reasonable profile of the toroidal current density and the safety factor when applied to ohmic tokamak discharges. By incorporating into the energy balance equation a diffusivity equation derived from a study of the stability of toroidal skin size electromagnetic drift modes, a differential equation for the poloidal magnetic field is obtained. The equation is solved for a Joint European Torus (JET) class tokamak and the results show that it is able to predict reasonable current and temperature profiles of ohmic discharges with the classical resistivity. The use of the energy balance equation is sufficient without any other assumptions or constraints, except that energy loss is dominated by electron thermal conduction. Author (CISTI)

N92-27447# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
DESTABILIZED ION ACOUSTIC TRANSIT MODE AND ANOMALOUS TRANSPORT IN TOKAMAKS
Akira Hirose and J. Weiland (Chalmers Univ. of Technology, Goeteborg, Sweden) Jul. 1991 34 p Sponsored by Natural Sciences and Engineering Research Council and European Atomic Energy Community-NFR Association
(PPL-123; CTN-92-60501) Avail: NTIS HC/MF A03

Kinetic and hydrodynamic analyses both predict that long wavelength electrostatic modes in tokamaks are the destabilized ion acoustic transit mode. The linear aspects of this mode are investigated in detail. In particular, the effect of trapped electron collisions is implemented to make the theory applicable to the peripheral region of a tokamak discharge as well as to the core region. It is shown that the instability is relatively insensitive to the collisionality parameter of trapped electrons. In addition, the instability does not require steep temperature gradients, although finite temperature gradients are further destabilizing. The instability is therefore operative over a wide range of discharge parameters from the collisionless core region to the dissipative edge region, without suffering ion Landau damping. A crossfield diffusivity expected from the instability has been estimated in a qualitative manner. In low-beta discharges, the diffusivity is smaller than the diffusivity due to the skin size electromagnetic drift mode. As beta increases, the diffusivity may become dominant, causing enhanced losses. Author (CISTI)

N92-27448# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
STABILITY OF LONG WAVELENGTH MODES IN TOKAMAKS
Akira Hirose Jan. 1991 19 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-117; CTN-92-60507) Avail: NTIS HC/MF A03

Long wavelength modes in the trapped ion regime in tokamaks were investigated in terms of an electromagnetic semilocal kinetic dispersion relation taking into account the ballooning nature, kinetic resonances, and collisionality. The incompressible magnetohydrodynamic ballooning mode was found to be strongly stabilized by the electron collisionality through trapped electron dynamics. For typical parameters, the growth rate is reduced by one order of magnitude when the collisionality parameter of trapped electrons is around 0.01. This suggests that the shorter wavelength compressible ballooning mode may be more dangerous than the incompressible counterpart. Electromagnetic (finite beta) corrections to the trapped ion mode were also examined. The trapped ion modes are suppressed when the plasma beta exceeds the ideal ballooning limit. A relatively steep temperature gradient and small collisionality parameter are required for the ion mode to be unstable. Author (CISTI)

N92-27449# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
LOCAL KINETIC ANALYSIS OF LOW FREQUENCY ELECTROSTATIC MODES IN TOKAMAKS
Akira Hirose Jul. 1990 23 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-110; CTN-92-60514) Avail: NTIS HC/MF A03

The ion temperature gradient mode and the trapped electron mode in tokamaks are reexamined in terms of a single (or unified) local kinetic dispersion relation incorporating the magnetic drift and transit effects for ions, and for collisions of trapped electrons. Circulating (untrapped) electrons are assumed to be adiabatic, and the mode frequency is assumed to be significantly smaller than the bounce frequency of trapped electrons, but larger than the ion bounce frequency. It is shown that low-frequency electrostatic instabilities in tokamaks are dominated by positive frequency modes. In particular, the ion temperature gradient mode with negative frequencies is unlikely to exist, provided that the ratio of the shear parameter to the safety factor is of order unity. A modest collision frequency of trapped electrons has a strong stabilizing influence on the instabilities over a wide range of the finite ion Larmor radius parameter. Author (CISTI)

N92-27563# Naval Research Lab., Washington, DC.
THE PLASMA PHYSICS OF PROCESSING DISCHARGES
Memorandum Report
W. M. Manheimer 28 Feb. 1992 87 p
(AD-A247560; NRL/MR/4707-92-6905) Avail: NTIS HC/MF A05

Plasma processing has grown into a tremendously important industrial capability over the last 20 years, and has done so with virtually no input from traditional plasma physicists. Plasma processing is important in such areas as nanocircuit fabrication, diamond thin film deposition, superconducting film deposition, and nanocube production and deposition. Undoubtedly there are other users in the laboratory also. There are plasma modeling efforts going on in the major industrial users, and university plasma physicists are beginning to set up programs. This memo attempts to set out in fairly simple form as much of the basic theory of processing discharges as is possible given constraints of reasonable length and simplicity. One thing about plasma processing is that it is very much an interdisciplinary area involving (at least) plasma physics, surface physics, atomic and molecular physics, and chemistry. This memo involves mainly the plasma physics; it touches on the atomic physics and chemistry for fairly simple plasmas, and it regards surfaces as passive objects that absorb whatever is incident and (mostly) do not emit anything. Better plasma processing models must ultimately treat the surface as an active substance which itself affects the plasma. GRA

N92-27579# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
STABILIZING EFFECT OF DISSIPATIVE TRAPPED ELECTRONS ON THE ENERGETIC ION MODES
Akira Hirose May 1991 17 p
(PPL-121; CTN-92-60503) Avail: NTIS HC/MF A03

Destabilization of magnetohydrodynamic (MHD) modes by energetic ions has relevance to both present day tokamaks and future reactor-grade tokamaks. A kinetic analysis of the role played by dissipative trapped electrons in stabilizing MHD modes is presented. It is shown that dissipative trapped electrons have significant stabilizing influence on long-wavelength modes such as the ballooning and Alfven modes. For modes with a poloidal mode number of O(10), an electron collisionality parameter of the order O(0.01) is sufficient to suppress the instabilities. CISTI

N92-27580# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
SKIN SIZE ELECTROMAGNETIC DRIFT MODE AND ANOMALOUS TRANSPORT
Akira Hirose Feb. 1991 39 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-119; CTN-92-60505) Avail: NTIS HC/MF A03

The stability of a low-beta tokamak discharge against skin size electromagnetic drift modes was investigated by employing a semi-local kinetic dispersion which incorporates the kinetic resonances of both ions and electrons. Strongly unstable modes

have been identified at crossfield wavelengths on the order of the collisionless skin depth. Even when the temperature gradients and trapped electrons are suppressed, the instability persists, being driven through the electron inverse Landau damping. The temperature gradient and trapped electrons further destabilize the instability. Over a wide range of beta below the ballooning limit, the maximum growth rate is on the order of the ion acoustic transit frequency. The quasilinear particle flux is radially inward (anomalous pinch) if the temperature gradient is greater than or about equal to 1. The proposed anomalous electron thermal diffusivity exhibits a good agreement with those inferred from several tokamaks, both in magnitude and in reproducing the radial profile, and predicts that the energy confinement time should improve in discharges with heavier ions (the isotope effect).
CISTI

N92-27581# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
ELECTROMAGNETIC SEMI-LOCAL KINETIC ANALYSIS ON THE ELECTRON TEMPERATURE GRADIENT MODE IN TOKAMAKS
Akira Hirose Feb. 1991 15 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-118; CTN-92-60506) Avail: NTIS HC/MF A03

Electromagnetic (finite beta) effects on the toroidal electron temperature gradient mode have been investigated in terms of an electromagnetic semi-local kinetic dispersion relation by implementing the ballooning nature and velocity space resonances. A finite beta is destabilizing in contrast to the case of the ion temperature gradient mode. However, the instability requires a relatively steep temperature gradient. The maximum growth rate occurs when the parallel electron resonance is most active, and the toroidal electron temperature gradient mode is essentially a destabilized electron transit (electron acoustic) mode.
Author (CISTI)

N92-27582# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
ELECTROMAGNETIC MICROINSTABILITY IN TOROIDAL PLASMAS
Akira Hirose Oct. 1990 14 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-115; CTN-92-60518) Avail: NTIS HC/MF A03

The stability of low-beta toroidal plasmas in the wavelength regime of the order of the skin depth is investigated. A gyrokinetic formulation for ions and electrons is adopted, and a mode equation is derived. It is shown that a low-beta tokamak discharge is linearly unstable against an electromagnetic drift mode over a wide range of crossfield wavelengths. The instability is an electromagnetic toroidal drift mode driven by the electron kinetic resonance. An active instability of skin size has been found which may provide an explanation for the high frequency short wavelength magnetic and concurrent density fluctuations recently observed in several tokamaks. A plausible nonlinear consequence is that the skin depth may be playing the role of random walk distance in toroidal devices.
Author (CISTI)

N92-27603# Naval Postgraduate School, Monterey, CA.
ON THE CONSEQUENCES OF BI-MAXWELLIAN DISTRIBUTIONS ON PARALLEL ELECTRIC FIELDS M.S. Thesis
Lewis J. Scott Dec. 1991 78 p
(AD-A246206) Avail: NTIS HC/MF A05

Observations made by the SCATHA and DE-1 spacecraft reveal the existence of equatorially trapped plasmas. These plasmas may be described by a bi-Maxwellian distribution function. A resultant parallel electric field arises as a consequence of this distribution. This thesis models the latitudinal density profiles and the resultant parallel electric field that occurs by integrating the particle distributions to obtain the density, and assuming quasi neutrality to solve for the electric potential and hence the electric field. The results show that the density profile is a maximum at the equator and the equatorially trapped plasma is confined closer to the equator for higher anisotropy ratios. The modeled density profiles are in agreement with some observations. The electric fields that result are on the order of 0.1 microvolt/m pointing away from the magnetic equator with greater anisotropy leading to larger electric field strength. Density minimums were also observed at the magnetic equator. This minimum can be explained by the presence of a field aligned electron distribution.
Author (GRA)

N92-27648# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
EFFECTS OF TEMPERATURE GRADIENTS ON THE TOROIDICITY INDUCED DRIFT MODE
Akira Hirose Feb. 1989 15 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-103; CTN-92-60474) Avail: NTIS HC/MF A03

Effects of both electron and ion temperature gradients on the toroidicity induced drift mode in the tokamak magnetic geometry have been investigated by taking into account full electron dynamics, employing a more accurate form for electron kinetic effects. Both the ion temperature gradient and the electron temperature gradient are considered in an analysis focusing mainly on the stability of long-wavelength drift modes. From a confinement point of view, long wavelength modes are expected to be more harmful than shorter wavelength modes. It has been found that the instability persists well above the critical temperature gradient previously found on the basis of the electron temperature gradient alone.
Author (CISTI)

N92-27866*# Carnegie-Mellon Univ., Pittsburgh, PA. Robotics Inst.
AUTONOMOUS PLANETARY ROVER Year End Report, 1991
Eric Krotkov, Reid Simmons, and William Whittaker Feb. 1992 52 p
(Grant NAGw-1175)
(NASA-CR-190465; NAS 1.26:190465; AD-A248161; CMU-RI-TR-92-02) Avail: NTIS HC/MF A04

This report describes progress in research on an autonomous robot for planetary exploration performed during 1991 at the Robotics Institute, Carnegie Mellon University. The report summarizes the achievements during calendar year 1991, and lists personnel and publications. In addition, it includes several papers resulting from the research. Research in 1991 focused on understanding the unique capabilities of the Ambler mechanism and on autonomous walking in rough, natural terrain. We also designed a sample acquisition system, and began to configure a successor to the Ambler.
GRA

N92-27882# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
ANALYTICAL FORMULA FOR IGNITION ACCESS CONDITION IN A MAGNETIC FUSION REACTOR
Osamu Mitarai (Kumamoto Inst. of Tech., Japan), Akira Hirose, and Harvey M. Skarsgard Oct. 1990 30 p
(PPL-114; CTN-92-60517) Avail: NTIS HC/MF A03

An analytical formula for the ignition access condition is presented for a magnetic fusion reactor with a given confinement scaling law. Assuming the fusion rate to be equal to the product of a coefficient A and the square of the temperature, the height of the generalized saddle point is calculated analytically. The appropriate coefficient A is determined by comparison with a numerical calculation of the generalized saddle point. Using the analytical ignition access condition, the confinement enhancement factor for a deuterium-tritium reactor can be easily estimated to good accuracy. Examples for the ITER-P tokamak reactor are presented.
Author (CISTI)

N92-27883# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
ANOMALOUS ELECTRON THERMAL DIFFUSIVITY, ANOMALOUS PARTICLE PINCH, AND ISOTOPE EFFECT DUE TO THE SKIN SIZE ELECTROMAGNETIC DRIFT MODE
Akira Hirose, O. Ishihara, O. Mitarai, and H. Tanaca (Yokohama National Univ., Japan) Oct. 1990 13 p Presented at the

13th IAEA International Conference on Plasma Physics and Controlled Nuclear Fusion Research, Washington, DC, 1-6 Oct. 1990 Sponsored by Natural Sciences and Engineering Research Council and Office of National Fusion Program of Canada
(PPL-116; IAEA-CN-53-I-2-1; CTN-92-60519) Avail: NTIS HC/MF A03

It is shown that the high frequency electromagnetic drift mode can explain several features of the anomalous thermal and particle transport in tokamaks. The collisionless electromagnetic drift mode has its maximum growth rate on the order of the ion transit frequency over a wide range of the plasma beta. A finite beta is destabilizing. The particle flux due to the instability is radially inward (anomalous pinch) and the predicted electron thermal diffusivity agrees well with those experimentally inferred from the Joint European Torus both in magnitude and in reproducing the radial profile. The favorable dependence of the energy confinement times on the plasma current and ion mass (the isotope effect) may also be explained by the instability. Density and magnetic fluctuations with frequencies and wavelengths expected from the theory were recently observed in several ohmic discharges. Author (CISTI)

N92-27921# Naval Research Lab., Washington, DC.
TRANSPORT IN ULTRA-DENSE PLASMAS PRODUCED BY A PICOSECOND LASER PULSE Memorandum Report
G. Mehlman, P. G. Burkhalter, and D. A. Newman (Sachs/Freeman Associates, Inc., Landover, MD.) 6 Mar. 1992 18 p
(AD-A247827; NRL/MR/4681-92-6941) Avail: NTIS HC/MF A03

This report presents recent experimental results obtained with the Table Top Terawatt laser at the Ultrafast Science Laboratory (University of Michigan). Interaction of the picosecond laser pulse with an overdense plasma was investigated with spectroscopic observations in the XUV range using a compact 1 m grazing incidence spectrograph. The emission from laser-irradiated targets made of silicon wafers coated with aluminum layers of variable thicknesses (from 100 to 5000 A) was recorded to allow spectral line intensity measurements from silicon and aluminum L-shell ions. The experiment was conducted using laser irradiation at both wavelengths lambda L = 1.06 or 0.53 microns. The laser energy penetration depths were derived from the variation of the XUV spectral intensities with the different layer thicknesses. The values obtained cover the range 300-700 A at lambda L = 1.06 microns and 250-400 A at lambda L = 0.53 microns. The smaller penetration depth determined at the laser doubled frequency corroborates earlier x-ray results in the keV range at the same laboratory. The penetration depths derived provide a better understanding of the electron heat transport phenomena, supporting in particular the assumption of thermal condition in an overdense plasma. GRA

N92-28044# Academy of Sciences of the Ukrainian SSR, Kiev. Inst. Teoreticheskoj Fiziki.
KOLMOGOROV SPECTRA IN A FINITE PRESSURE PLASMA
M. O. Vakulenko 1991 8 p
(DE92-621531; ITP-91-31) Avail: NTIS HC/MF A02

Nonequilibrium self-similar spectra of short-wave low-frequency electro- and magnetostatic fluctuations in isothermal finite-(beta) plasma, connected with a constant flow of anastrophy over the spectrum, are calculated. DOE

N92-28057# City Coll. of the City Univ. of New York, NY. Dept. of Computer Science.
COMPUTATIONAL METHODS FOR STELLERATOR CONFIGURATIONS
O. Betancourt 1992 33 p
(Contract DE-FG02-89ER-53285)
(DE92-011131; DOE/ER-53285/2) Avail: NTIS HC/MF A03

This project had two main objectives. The first one was to continue to develop computational methods for the study of three dimensional magnetic confinement configurations. The second one was to collaborate and interact with researchers in the field who can use these techniques to study and design fusion experiments. The first objective has been achieved with the development of the spectral code BETAS and the formulation of a new variational approach for the study of magnetic island formation in a self consistent fashion. The code can compute the correct island width corresponding to the saturated island, a result shown by comparing the computed island with the results of unstable tearing modes in Tokamaks and with experimental results in the IMS Stellarator. In addition to studying three dimensional nonlinear effects in Tokamaks configurations, these self consistent computed island equilibria will be used to study transport effects due to magnetic island formation and to nonlinearly bifurcated equilibria. The second objective was achieved through direct collaboration with Steve Hirshman at Oak Ridge, D. Anderson and R. Talmage at Wisconsin as well as through participation in the Sherwood and APS meetings. DOE

N92-28193# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
OPERATION PATH METHOD FOR IGNITION CRITERION IN A D-T TOKAMAK REACTOR
Osamu Mitarai (Kumamoto Inst. of Tech., Japan), Akira Hirose, and Harvey M. Skarsgard Jun. 1991 19 p
(PPL-122; FFP-3-91; CTN-92-60502) Avail: NTIS HC/MF A03

The method of the operation path on the generalized ignition contour map is presented to treat the ignition accessibility of a deuterium-tritium tokamak reactor for different types of confinement scaling including offset linear scaling. It is shown that the operation paths and ignition boundary provide a useful ignition criterion for various types of scaling. ITER tokamaks with low and high toroidal fields are used as examples. The one to one correspondence of the operation path to POPCON analysis is also presented.
Author (CISTI)

N92-28194# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
SADDLE POINT CONDITION FOR D-He-3 TOKAMAK FUSION REACTOR
Osamu Mitarai (Kumamoto Inst. of Tech., Japan), Akira Hirose, and Harvey M. Skarsgard Aug. 1989 55 p
(PPL-106; CTN-92-60508) Avail: NTIS HC/MF A04

The concept of a generalized ignition contour map is used to study the ignition criterion for a deuterium/helium-3 fusion reactor with plasma temperature and density profiles. Direct heating scenarios to the deuterium/helium-3 ignition regime without the help of deuterium-tritium burning are considered. The machine size and enhancement factor for the confinement time required in order to reach deuterium/helium-3 ignition can be simply determined by comparing the height of the operation path with Goldston L-mode scaling and the height of the generalized saddle point. Fuel dilution effects by fusion products and impurities, the confinement degradation effect due to 14 MeV protons and the operation paths are also considered. To lower the height of the saddle point, and hence the auxiliary heating power, the fuel composition is optimized and operation in the hot ion mode is examined. CISTI

N92-28195# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
BALLOONING AND DRIFT-ALFVEN MODES IN TOKAMAKS
Akira Hirose and Osamu Ishihara (Texas Technological Univ., Lubbock.) Mar. 1989 32 p Sponsored by Natural Sciences and Engineering Research Council
(Grant AF-AFOSR-0156-86)
(PPL-104; CTN-92-60509) Avail: NTIS HC/MF A03

The ideal magnetohydrodynamic (MHD) ballooning mode in tokamaks has been analyzed in the compressible limit. The stability boundary becomes strongly dependent on the toroidicity parameter. The mode equation in the compressible limit also prevails in the incompressible limit. Inappropriate use of the adiabatic pressure evolution equation in previous studies is pointed out. The ideal MHD mode equation is generalized for the drift-Alfven mode in tokamaks allowing arbitrary wave frequency and cross-field wavelength. When the poloidal beta is about 1, an average value for an ohmically-heated tokamak, a dispersion relation emerges in

the short wavelength region which may give an explanation for an unidentified mode which has actually been detected in the TEXT tokamak. Author (CISTI)

N92-28196# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
EFFECTS OF TEMPERATURE GRADIENTS ON THE TOROIDICITY INDUCED DRIFT MODE
Akira Hirose and S. G. Tsotsonis Jan. 1990 33 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-108; CTN-92-60512) Avail: NTIS HC/MF A03

Effects of both electron and ion temperature gradients on the toroidicity induced drift mode have been investigated by taking into account full electron dynamics (resonant and nonresonant). An algebraic ion density moment is derived and compared with the exact kinetic ion density moment. Using the ion density moment, a mode equation is derived and variationally analyzed. The results are compared with a local kinetic dispersion relation. It is shown that in tokamaks, long wavelength drift modes persist even when the temperature gradients are large, in contrast to a conclusion from previous work that a modest electron temperature gradient should stabilize the drift mode. Both ion temperature gradient and the contribution from nonresonant electrons have been found to be crucial. The drift mode is smoothly connected to the trapped electron mode with larger growth rates. This has been shown by solving the local kinetic dispersion relation which incorporates magnetic drift and Landau resonances of circulating electrons and magnetic resonance of trapped electrons. Long-wavelength modes persist over wide parameter ranges, such as temperature gradients and ballooning parameter. Author (CISTI)

N92-28197# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
LOCAL KINETIC ANALYSIS OF THE BALLOONING MODE IN TOKAMAKS
Akira Hirose Jul. 1990 14 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-111; CTN-92-60515) Avail: NTIS HC/MF A03

The problem of ballooning marginal stability in tokamaks, in both the incompressible and compressible limits, is examined in terms of a local kinetic dispersion relation by incorporating all possible kinetic resonances of both electrons and ions. In particular, the ion Landau resonance, which has been ignored in previous kinetic theories, is retained. A low-beta, collisionless tokamak discharge with shifted circular magnetic surfaces is assumed; for simplicity, particle trapping is ignored. The analysis indicates that the stability boundary of the ballooning mode in tokamaks is quite insensitive to whether a plasma is compressible or incompressible. The maximum growth rate of the kinetic ballooning mode is smaller than the magneto hydrodynamic counterpart typically by a factor of 5, and it does not exceed the ion transit frequency by a large margin. The findings may imply that the ballooning instability should not be as violent as conjectured to date, and explain the achievement in some tokamaks of stable discharge in the beta regime that should be magnetohydrodynamic ballooning unstable. Author (CISTI)

N92-28198# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
ELECTROMAGNETIC AND KINETIC EFFECTS ON THE ION TEMPERATURE GRADIENT MODE
J. Weiland (Chalmers Univ. of Technology, Goeteborg, Sweden) and Akira Hirose Jul. 1990 14 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-113; CTN-92-60516) Avail: NTIS HC/MF A03

The effects of finite beta, ion kinetic damping and trapped electrons on the toroidal ion temperature gradient (ITG) mode have been investigated by two methods, fully toroidal fluid formulation corrected for ion Landau damping and an electromagnetic local kinetic dispersion relation. The ITG mode is stabilized at beta above the critical beta for the ideal magneto hydrodynamic ballooning mode. Ion Landau damping increases the critical temperature gradient typically by a factor of 2. The instability is operative in relatively narrow windows in the safety factor range of about 1.5 to 3.5, and the finite ion Larmor radius parameter range of about 0.05 to 0.5. The growth rate remains smaller than the ion transit frequency. Author (CISTI)

N92-28204# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
EFFECTS OF KINETIC DAMPING ON THE ION TEMPERATURE GRADIENT MODE IN TOKAMAKS
Akira Hirose Mar. 1989 11 p Sponsored by Natural Sciences and Engineering Research Council
(PPL-105; CTN-92-60510) Avail: NTIS HC/MF A03

The ion interchange mode in tokamaks is driven by the ion pressure gradient combined with a bad magnetic curvature. The inadequacy of the hydrodynamic approximation for this mode is pointed out. A new integral equation formulation is developed, adopting a semilocal kinetic dispersion relation based on the assumption of adiabatic electrons and incorporating both magnetic drift and Landau damping. Local kinetic dispersion is then considered by artificially suppressing the Landau resonance. It is shown that the magnetic drift resonance introduces a strong damping, and a threshold value for the temperature gradient inverse aspect ratio emerges. The residual small growth rate predicted from the local kinetic dispersion relation further reduces when Landau resonance is included. That dispersion relation is modified and it is shown that the instability essentially vanishes. In summary, damping due to the ion magnetic drift and Landau resonances almost completely stabilizes the ion temperature gradient mode in tokamaks. CISTI

N92-28205# Saskatchewan Univ., Saskatoon. Plasma Physics Lab.
MICROBALLOONING MODE IN TOKAMAKS
Akira Hirose, S. Roy Choudhury, and O. Ishihara (Texas Technological Univ., Lubbock.) Aug. 1989 14 p Sponsored in part by Natural Sciences and Engineering Research Council
(Grant AF-AFOSR-0156-86)
(PPL-107; CTN-92-60511) Avail: NTIS HC/MF A03

Results are presented of linear analysis of electromagnetic drift modes in tokamak magnetic geometry. An isothermal, low beta, collisionless tokamak discharge with axisymmetry is considered. Both ions and electrons are described by drift kinetic approximation, and the ion density perturbation and electron density perturbation are derived. The electron current parallel to the magnetic field is found from the electron continuity equation, and the charge neutrality and Ampere's law are combined to derive a single mode equation for the scalar potential. A new short-wavelength electromagnetic drift mode of skin size on the order of the collisionless skin depth is predicted for a tokamak discharge with a beta value well below the ideal magneto hydrodynamic limit. The instability is of ballooning nature, and may explain the empirical anomalous electron thermal diffusivity prevailing in tokamaks. Author (CISTI)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N92-27201# Air Force Inst. of Tech., Wright-Patterson AFB, OH. Foreign Technology Div.
SPECTRAL PROPERTIES OF A NOVEL LASER CRYSTAL Y3(In, Ga)2Ga3O12:Cr3(+)
Li Yunkui, Tang Honggao, Hang Yin, and Chen Shuchun 19 Nov. 1991 11 p Transl. into ENGLISH from Zhonggou Jiguang (China), v. 17, no. 12, 1990 p 750-753
(AD-A246254; FTD-ID(RS)T-0695-91) Avail: NTIS HC/MF A03

Spectral properties of a novel phonon terminated laser crystal Y3(In, Ga)2Ga3O12:Cr(3+) grown by the flux method are reported for the first time. The results show that the spectral properties of this novel crystal are compatible with those of Gd3(Se,

Ga)3Ga3O12:Cr(3+) and is a potential ambient temperature tunable laser crystal. Gd3(Sc, Ga)2Ga3O12:Cr(3+) (shortened to GSGG:CR3+) is a type of phonon-terminated laser crystal with excellent capabilities. It has a relatively weak crystal field and relatively strong electron-phonon coupling. At room temperatures a strong terminal phonon emission spectrum with a half width of about 100 nm can be observed. At the same time, experimentally at room temperatures, a wide band continuous tunable laser emission has been observed. Since it has been reported, a great deal of attention has been paid to it. However, since Scandium is rare and expensive its applications are limited. GRA

N92-27216# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.

SOLID STATE RESEARCH Quarterly Technical Report, 1 May - 31 Jul. 1991

Alan L. McWhorter 15 Aug. 1991 74 p

(Contract F19628-90-C-0002)

(AD-A247338; Rept-1991; Rept-3; ESD-TR-91-153) Avail: NTIS HC/MF A04

A model has been developed for mass transport of two-dimensional surface profiles for which a Cartesian coordinate system can be conveniently used. Simple analytical solutions have been obtained that provide valuable insights for the fabrication of microoptical structures. A mode of laser operation has been discovered that allows a single Nd:YAG laser with an intracavity nonlinear crystal to stably generate light at the 589 nm sum frequency of the 1064 and 1320 nm outputs. The dynamics of this new mode of operation has been investigated experimentally. The frequency response of the microchip laser to pump-power modulation has been derived in closed form. It is shown that pump-power modulation is a viable technique to change the output frequency of microchip lasers. Strained InGaAs/AlGaAs quantum well diode lasers have been fabricated on Si substrates for the first time, with the objective of improving laser reliability by incorporating in the active layer to inhibit the propagation of dark-line defects. One graded-index separate confinement heterostructure 'single quantum well' laser with an In0.05Ga0.95As active layer has operated CW for 56.5 h, a record lifetime for GaAs-based diode lasers on Si. Thin films of polysilyne have been patterned by exposure with 193 nm radiation followed by selective etching of the unexposed areas in a HBr plasma. Patterns with 0.2 microns resolution and high aspect ratio were obtained when this dry development process was applied to bilayers consisting of polysilyne on an organic planarizing layer. GRA

N92-27345# Argonne National Lab., IL.

MAGNETO-OPTICAL STUDIES OF ULTRATHIN FERROMAGNETIC FILMS

S. D. Bader Jan. 1992 15 p Presented at the Resolution Electron Microscopy Workshop, Wickenburg, AZ, 8-11 Jan. 1992

(Contract W-31-109-eng-38)

(DE92-010252; ANL/CP-75540; CONF-920199-1) Avail: NTIS HC/MF A03

The focus of this paper is on surface magnetic anisotropy of 3d ferromagnetic transition metals. While the exchange interaction is responsible for the net magnetization associated with ferromagnetism, it is the magnetic anisotropy energetics that determine the direction of the magnetization with respect to the crystallographic axes and to the shape of the sample. DOE

N92-27381# Research Triangle Inst., Research Triangle Park, NC.

DEVELOPMENT OF A Ge/GaAs HMT TECHNOLOGY BASED ON PLASMA ENHANCED CHEMICAL VAPOR DEPOSITION Annual Report, 1 Jan. - 31 Dec. 1991

R. J. Markunas and G. G. Fountain 21 Jan. 1992 29 p

(Contract N00014-86-C-0838)

(AD-A246991; RTI/3628/ANNUAL; RTI-83B-3628) Avail: NTIS HC/MF A03

The following report details the progress on ONR contract number N-00014-86-C-0838 during the period from January 1, 1991 to December 31, 1991. This program is targeted at development of a Ge on GaAs high mobility transistor (HMT) technology. During this period, the work has focused on 2 areas. The first area described involves the effect of the Si deposition parameters on the electrical characteristics of the composite Ge pseudomorphic Si-SiO2 MIS structure. Complementary n and p type Ge MIS structures are presented which exhibit low midgap Dit values. The second area described involves the fabrication of Ge MISFET devices using the pseudomorphic Si-SiO2 gate insulator. These n-channel transistors exhibit a transconductance of 24 mS/mm at a gate length of 2 microns. GRA

N92-27402# Research Triangle Inst., Research Triangle Park, NC.

PASSIVATION AND GATING OF GaAs AND Si SURFACES USING PSEUDOMORPHIC STRUCTURES Final Annual Report, 1 Jul. 1990 - 30 Jun. 1991

S. V. Hattangady, M. J. Mantini, R. A. Rudder, G. G. Fountain, and R. J. Markunas 19 Feb. 1992 45 p

(Contract N00014-88-C-0433)

(AD-A246990) Avail: NTIS HC/MF A03

This program explores MISFET structures in material systems with no suitable native oxide. This has included GaAs, and in this latest period Ge. A novel structure has been developed utilizing a thin (less than 15 A) epitaxial layer of Si to control the chemical interface formed by deposition of SiO2. Detailed characterization of the interfacial chemistry is presented along with p-channel MISFET results. A room temperature, p-channel transconductance of 52 mS/mm was measured at a gate length of 2 microns along with a peak effective hole mobility of 430 sq cm/(V x s). GRA

N92-27409# Argonne National Lab., IL.

THE VARIABILITY RESIDUAL STRESSES OF THICK SUPERCONDUCTOR FILMS DURING ORTHORHOMBIC TO TETRAGONAL TRANSFORMATION

W. Wu, S. Danyluk (Illinois Univ., Chicago.), M. T. Lanagan, and R. B. Poeppel 1992 9 p Presented at the 8th International Conference on Advanced Science and Technology, Argonne, IL, 28 Mar. 1992

(Contract W-31-109-eng-38)

(DE92-010499; ANL/CP-75687; CONF-9203110-2) Avail: NTIS HC/MF A02

YBa2Cu3O(x) thick films were deposited by spray pyrolysis of a sol-gel on 10 cm diameter polycrystalline MgO wafers. The film thickness was built up in layers of approximately 1 micron thick. The in-plane residual stresses were measured by an optical interferometry (shadow moire) method as a function of film structure. In-plane residual stress maps over the area of the wafer were obtained. The average stress of the 5 micron orthorhombic phase was 0.84 GPa. As the film transforms from the orthorhombic to the tetragonal structure, the tensile stresses decreased by 0.5 GPa. DOE

N92-27598# Stanford Univ., CA. Dept. of Electrical Engineering.

SPACE DIVISION SWITCHES BASED ON SEMICONDUCTOR OPTICAL AMPLIFIERS

R. F. Kalman, L. G. Kazovsky, and J. W. Goodman 1991 13 p

(Contract N00014-91-J-1857)

(AD-A247619) Avail: NTIS HC/MF A03

Semiconductor optical amplifiers (SOA's) can be used in space-division (SD) switches to provide both switching and optical gain. We present a general analysis of optical switches using SOA's, considering noise and saturation effects associated with amplified spontaneous emission. Based on this analysis, we derive size limitations of SD switches. Three specific SD switching architectures are considered. For a lumped gain matrix vector multiplier (MVM) switch, switch sizes are limited to the range of 3000 x 3000 for SOA's with saturation output powers of 100 mW. Based on the effects considered in our analysis, distributed gain MVM switches and Benes switches are not limited by signal-to noise ratio and saturation up to sizes of 10 exp 80 x 10 exp 80 for SOA's with saturation output powers of 100 mW. GRA

N92-27607# Army Missile Command, Redstone Arsenal, AL. Systems Simulation and Development Directorate.
THE RELEVANCE OF THE DEBROGLIE VELOCITY (V1= h/2md1) TO SHOCK LOADING INDUCED REACTIONS IN LEAD AZIDE Final Report, Apr. 1990 - Apr. 1991
James P. Billingsley and James M. Oliver Sep. 1991 30 p
(AD-A246478; AD-E951748; AMSMI/TR-RD-SS-91-10) Avail: NTIS HC/MF A03

Available experimental shock induced reactive pressure levels for dextrinated and single crystal lead azide are compared to predicted Pv sub 1 magnitudes. The comparison is favorable and it is suggested that particle motion instability near V sub 1 magnitudes (the V sub 1 Effect) is responsible for the observed reactions in these marginally stable materials. Similar comparative analyses for other primary energetic materials are needed to further evaluate the V sub 1 Effect on these substances. Author (GRA)

N92-27632# University of Western Washington, Bellingham.
CHARACTERIZATION OF SEMI-INSULATING GALLIUM ARSENIDE Final Report
John S. Blakemore 30 Aug. 1991 37 p
(Contract N00014-90-P-2030)
(AD-A246511) Avail: NTIS HC/MF A03

This project was established for the purpose of characterization of samples from melt grown single crystals of nominally undoped gallium arsenide, primarily such crystals as grown by the vertical zone melt (VZM) method at the Naval Research Laboratory. During this period electrical and optical samples were measured for 13 of these VZM-grown gallium arsenide. Measurements made at Western Washington University (WWU) under the terms of this project were in accordance with the Statement of Work provided at the project's outset: including near-infrared transmittance measurements for determination of neutral and ionized EL2 center concentrations, local vibrational mode (LVM) measurements in the mid-IR relative to carbon impurities, and measurements of dc electrical transport properties versus temperature. A program for growth of GaAs and other semiconductors by the VZM method began at NRL several years ago, and the practicality of this method for growing semi-insulating (SI) nominally undoped GaAs in a pBN crucible was demonstrated by Swiggard (1989) and in various subsequent papers. GRA

N92-27705# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
QUANTUM DEVICES Final Report, 28 Sep. 1990 - 27 Sep. 1991
1992 4 p
(Contract N00014-90-K-2023)
(AD-A247795) Avail: NTIS HC/MF A01

This purpose of this project was to study novel quantum effects in microstructures, which might have electronic device potentials. The effects we chose to study are in one-dimensional (1-D) wires, i.e., wires with transverse dimensions small compared to coherence lengths. We have completed the mask design which will allow us to study current flow in 1-D wires. Transverse dimensions are varied by making wires with different transverse dimensions lithographically. Up to the present time, transverse dimension variation has been accomplished by changing the voltage means split gate Schottky contacts along the wire. Steps can be observed in the IV curves of wires. The advantage lithographic definition of the wires is that wire dimensions can be measured directly and quality of the lithography can be assessed. A second experiment on the mask will allow us to study exchange effects of electrons in two wires. Ruden and Wu have predicted that the exchange effect between two coupled 2-D gases can be appreciable, and can cause the lowest energy state to be the state with all the electrons in one channel, rather half the electrons in each channel as might be expected. For 2-D gases the effect is small and is expected to be observable only in the liquidate temperature range. GRA

N92-27983# Naval Postgraduate School, Monterey, CA.
EFFECTS OF HIGH ENERGY ELECTRON IRRADIATION ON A YTTRIUM BARIUM(2) COPPER(3) OXYGEN(7-DELTA) HIGH TEMPERATURE SUPERCONDUCTOR M.S. Thesis
Sean M. Connors Sep. 1991 104 p
(AD-A246895) Avail: NTIS HC/MF A06

High quality, single crystalline, high-temperature superconductors were irradiated with 88.5 and 92.0 MeV electrons at various fluences to a maximum of 2.5+/-0.5(10)(exp 18) electrons/sq cm. The samples were manufactured at the Texas Center for Superconductivity in support of an experiment investigating the effects of various irradiations on the critical current. By introducing artificial pinning centers, such as those produced by electron irradiation, in high-temperature superconductors, an applied magnetic flux can be effectively pinned and the current carrying capacity can be increased. By comparing the critical current density enhancement effects to the total atomic displacement damage, it is found that the enhancement depends heavily on the type and energy of radiation and on the beam direction with respect to the crystal. It was also found that a threshold defect-size for effective flux pinning exists. Cascade defects, 10-20 A and larger, are at least a thousand times more effective than point defects as pinning centers. GRA

N92-27985# Rockwell International Science Center, Thousand Oaks, CA.
RESEARCH IN HIGH DIELECTRIC PROPERTIES OF FERROELECTRIC MATERIALS Final Report, 14 May 1981 - 29 Nov. 1991
R. R. Neurgaonkar Jan. 1992 86 p
(Contract N00014-81-C-0463)
(AD-A246899; SC5345.FR) Avail: NTIS HC/MF A05

The magnetron sputtering technique was used to grow morphotropic phase boundary ferroelectric thin films of tungsten bronze PBKNN and perovskite BaTiO3, KTN and PZT. Film crystallinity was found to be strongly influenced by substrate temperature, with temperatures of 500-6000 C usually required. Single crystal PSKNN films were grown on SBN:60 substrates, whereas grain-oriented films were achieved on (100)-oriented silicon substrates. PLZT films are grain-oriented for (001)-oriented SBN and have excellent surface quality for guided wave applications. This is the first time such films have been grown on tungsten bronze substrates. Both PSKNN and PZT films present a great promise for SLM and electronic memory applications. GRA

N92-28012# Naval Surface Warfare Center, Bethesda, MD. Ship Materials Engineering Dept.
EFFECT OF LEAD OXIDE AND TITANIA ON THE STRUCTURE, MORPHOLOGY AND SUPERCONDUCTIVITY OF Y-Ba-Cu-O CERAMIC MATERIALS Interim Report, Oct. 1990 - Sep. 1991
A. S. Rao 31 Jan. 1992 22 p
(AD-A248706; DTRC/SME-92-09) Avail: NTIS HC/MF A03

The effect of the addition of PbO and TiO2, in the concentration range 0.15 wt. percent on crystal structure, morphology and superconductivity of YBa2CU3O(6+X) was investigated. The results suggest that the addition of either TiO2 or PbO (for PbO concentration above 3 wt. percent) reduces the primary particle size of YBa2CU3O(6+X). Both TiO2 and PbO tends to stabilize the nonsuperconducting tetragonal phase at the expense of superconducting orthorhombic phase of YBa2CU3O(6+X). The orthorhombic-tetragonal phase transformation appears to be related to the additive induced oxygen depletion of YBa2CU3O(6+X) to form Y2BaCuO(y). Such a phase transformation-process not only increases the normal state resistance of the superconductor, but also lowers the superconducting transition temperature. GRA

N92-28077# Emory Univ., Atlanta, GA. Dept. of Chemistry.
SPECTROSCOPY AND REACTIONS OF HYDRAZOIC ACID ON SILICON SINGLE CRYSTAL SURFACES. (2). HN3 AND DN3 ON Si (100)

Jason C. Chu, Yue Bu, and M. C. Lin 1992 12 p
(Contract N00014-89-J-1235)
(AD-A247047; TR-9) Avail: NTIS HC/MF A03

Hydrazoic acid (HN3) was employed-for the first time as a nitrogen source for nitridation of Si surfaces. Its spectroscopy and reactions on different low Miller index surfaces were investigated with XPS, UPS (X-ray and ultra-violet photoelectron spectroscopy), AES (Auger electron spectroscopy), and HREELS (high resolution electron energy loss spectroscopy) at temperatures between 120 and 1350 K. This study focuses on the spectroscopy and reactions on the Si(100) surface. HN3 was found to adsorb molecularly on these surfaces since all molecular vibrational peaks such as the HN-NN stretching vibration at 150 meV, the HNN=N stretching vibration at 270 meV, and the H-N3 stretching vibration at 415 meV could be clearly observed by HREELS. These assignments were confirmed by an isotopic study using DN3. Warming the surface from 120 to 250 K caused HN3 to desorb as well as to decompose into N2 and NH, which further dissociated to produce N and H as the surface was annealed from 580 to 800 K. The presence of H atoms was revealed by the appearance of the Si-H stretching vibration at 267 meV. At T(sub s) is greater than 800 K, H atoms began to desorb, while N remained on the surface forming Si3N4 at T(sub s) = 1350 K. These observations were fully corroborated by UPS, XPS, and AES data. The results of AES and UPS analyses also indicate that nitrogen could diffuse into the bulk of Si (100), similar to the Si(110) case. GRA

N92-28081# Northwestern Univ., Evanston, IL. Dept. of Materials Science and Engineering.
MECHANISM FOR DIAMOND NUCLEATION AND GROWTH ON SINGLE CRYSTAL COPPER SURFACES IMPLANTED WITH CARBON
T. P. Ong, F. Xiong, R. P. Chang, and C. W. White Apr. 1992 10 p
(Contract N00014-89-J-1848)
(AD-A248958; TR-7) Avail: NTIS HC/MF A02

The nucleation and growth of diamond crystals on single crystal copper surfaces implanted with carbon ions has been studied. Microwave plasma enhanced chemical vapor deposition was used for diamond growth. The single crystal copper substrates were implanted either at room temperature or at elevated temperature (-820 C) with carbon ions prior to diamond nucleation. This procedure leads to the formation of a graphite film on the copper surface which greatly enhances diamond crystallite nucleation. From our study we construct a simple lattice model for diamond growth on graphite as (111) parallel to (0001) and (110) parallel to (1120). GRA

N92-28165# Cardiff Univ. (Wales).
AN XPS STUDY OF THE FORMATION OF THIN Pt AND Ir SILICIDE OVERLAYERS ON Si (100) 2 X 1 SURFACES Final Technical Report, Sep. 1989 - Sep. 1990
S. J. Morgan and R. H. Williams Nov. 1991 24 p
(Contract FL2878-87-0-0021)
(AD-A245929; RL-TR-91-312) Avail: NTIS HC/MF A03

The formation of thin (5-100A) Platinum and Iridium silicide films on the clean Si (100) 2x1 surface has been studied using XPS. A detailed analysis of the Si 2p and Pt/Ir 4f core-level photoemission lineshapes and intensities has allowed the determination of the phase formation sequence, and the resulting change in Schottky barrier height, with annealing. Progressively silicon rich silicides were formed with increasing temperature, at temperatures greater than 600 C. This process was limited by rapid surface segregation of silicon atoms from the substrate. Small changes in relative Schottky barrier height were observed for different silicide phases, with the monosilicide phases giving the lowest Schottky barriers. GRA

N92-28218# Notre Dame Univ., IN. Dept. of Physics.
SCANNING TUNNELING MICROSCOPY Final Report, 1 Oct. 1987 - 30 Sep. 1990
John D. Dow 17 Mar. 1992 5 p
(Contract DAAL03-87-K-0112)
(AD-A249262; ARO-24087.2-EL) Avail: NTIS HC/MF A01

Scanning tunneling microscopy (STM) has been used to image and modify the surfaces of III-V, II-VI and group IV semiconductors. A tip-simulator based on a photocode was developed. The simulator allows the development of ultra-sensitive electronics for controlling STM tip movement. Various forms of 'nano-machining', including chiselling, sanding, and sweeping of atoms on a surface, were developed. An STM design was modified to allow bending of long thin samples of Si(100) in UHV to permit the study of surface strain. A variety of studies were conducted on Au (in air) CdTe (in air), Hg(1-x)Mn(x)Te (under glycerin), and Hg(1-x)Cd(x)Te (in air and under glycerin). GRA

N92-27268*# Technical Univ. of Denmark, Lyngby. Physics Lab. 3.
FOLLOW UP ON THE CRYSTAL GROWTH EXPERIMENTS OF THE LDEF Abstract Only
K. F. Nielsen and M. D. Lind (Rockwell International Science Center, Thousand Oaks, CA.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 59 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27313*# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
HOLOGRAPHIC DATA STORAGE CRYSTALS FOR THE LDEF Abstract Only
W. Russell Callen and Thomas K. Gaylord *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 110 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27318*# Aerospace Corp., El Segundo, CA.
POST-FLIGHT ANALYSES OF THE CRYSTALS FROM THE M0003-14 QUARTZ CRYSTAL MICROBALANCE EXPERIMENT Abstract Only
W. K. Stuckey, G. Radhakrishnan, and D. Wallace (QCM Research, Laguna Beach, CA.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 115 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27319*# Martin Marietta Corp., Baltimore, MD.
STUDY OF FACTORS DETERMINING THE RADIATION SENSITIVITY OF QUARTZ CRYSTAL OSCILLATORS (A0189) Abstract Only
J. S. Ahearn and J. D. Venables *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 116 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N92-27527# Naval Postgraduate School, Monterey, CA.
NUMERICAL INVESTIGATIONS OF BREATHER SOLITONS IN NONLINEAR VIBRATORY LATTICES M.S. Thesis
Cleon Walden, Jr. Dec. 1991 94 p
(AD-A246524) Avail: NTIS HC/MF A05

Breather solitons in a one-dimensional lattice of coupled nonlinear oscillators are numerically investigated. These are localized nonpropagating steady states that exist at frequencies either below the linear cutoff frequency (corresponding to the extended mode in which all the oscillators are in-phase) or above the upper linear cutoff frequency (corresponding to the extended

mode in which each oscillator is 180 deg out-of-phase with its immediate neighbors). The lattice is damped and parametrically driven. A nonlinear Schrodinger theory, which assumes a modulational amplitude that is weakly nonlinear and slowly varying in space, is compared to numerical data. The error is roughly 5 percent at low amplitudes and 20 percent at high amplitudes. The regions in the drive parameter plane (amplitude vs. frequency) where the breathers exist are numerically determined and compared to theory. A substantial discrepancy occurs at lower drive amplitudes where the theory predicts that the lower cutoff breather should exist, but where an instability is observed. Also in contrast to the theory, the region of the upper cutoff breather has relatively large areas in which quasiperiodicity occurs or the motion decays to rest. Quasiperiodicity is also observed in the lower cutoff breather. Finally, instead of a global parametric drive, an end drive is investigated. It is found that, for drive frequencies outside the linear propagation band, there is an amplitude threshold for the periodic ejection or 'shedding' of propagating breather solitons. The quasiperiodicity that occurs for a global parametric drive may be a consequence of soliton shedding. GRA

N92-27688# Queens Univ., Kingston (Ontario). Dept. of Physics.
SOLUTIONS OF EINSTEIN'S EQUATIONS HAVING FUNCTIONALLY SEPARABLE METRICS Ph.D. Thesis
Eric George Shaver Mar. 1990 97 p
(ISBN-0-315-60751-3; CTN-92-60482) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The Einstein equations for spacetimes with various symmetries and energy-momentum tensors are examined under the assumption that the metric coefficients are separable functions of the coordinates. In the case of spherically symmetric imperfect fluid solutions, it was found that the only solutions which have an origin, have no heat flux, satisfy the weak and strong energy conditions, and are nonsingular at the origin, are the Robertson-Walker solutions. All possible solutions to the Einstein equations for a perfect fluid are obtained. The spacetimes in this case must be either plane, spherically, or hyperbolically symmetric. The only nonstatic solutions which obey the weak and strong energy conditions and are nonsingular on surfaces defined by x=constant, are the Robertson-Walker solutions, space-times with w=S=B=1, a class of plane symmetric solutions, and a class of solutions with w=B and g=constant. Cylindrically symmetric solutions for which the energy-momentum tensor is T(sup t)(sub t)=T(sup z)(sub z)=-sigma(r,t) are examined. All possible solutions are found. It is shown that in all the nonsingular cases, regions with nonzero energy density can easily be embedded in a vacuum exterior. It is further shown that these vacuum regions cannot be matched smoothly onto a Robertson-Walker exterior. Author (CISTI)

N92-28107# Naval Postgraduate School, Monterey, CA.
INVESTIGATION OF AN ARGON-FILLED THERMOACOUSTIC PRIME MOVER M.S. Thesis
John D. Lamade, II Dec. 1991 57 p
(AD-A246751) Avail: NTIS HC/MF A04

The goal of this thesis is to investigate the behavior of a thermoacoustic prime mover filled with argon. Data was collected for three different operating conditions: (1) prior to the onset of acoustic oscillation; (2) immediately after onset; and (3) after the prime mover had reached steady state, at mean gas pressures of approximately 80 kPa, 205 kPa, and 305 kPa. Measured values of 1/Q are compared to predictions of a theory. After onset, Q is determined from measurement of the rise time of the oscillations. The data set collected is the first to span onset and results show good agreement with theory. It is concluded that the theory can be used to provide reasonable input for a model to predict the steady state waveforms. GRA

N92-28160# Stanford Linear Accelerator Center, CA.
ESTIMATION OF OBLIQUE ELECTROWEAK CORRECTIONS
Tatsu Takeuchi Mar. 1992 12 p Presented at the International Workshop on Electroweak Symmetry Breaking, Hiroshima, Japan, 12-15 Nov. 1991
(Contract DE-AC03-76SF-00515)
(DE92-010742; SU-SLAC-PUB-5730; CONF-9111182-4) Avail: NTIS HC/MF A03

I will first review the experimental limits placed on the oblique correction parameters S and T. Then, I will discuss how the value of S can be estimated for running and walking technicolor theories. DOE

N92-28215# International Centre for Theoretical Physics, Trieste (Italy).
GEOMETRIC QUANTIZATION OF THE MOMENTUM MAPPING ASSOCIATED WITH COUPLED HARMONIC OSCILLATORS
I. M. Mladenov and V. V. Tsanov (Sofia Univ., Bulgaria) May 1991 10 p
(DE92-622381; IC-91/42) Avail: NTIS HC/MF A02

We study a mechanical system whose dynamics is governed by a pair of commuting Hamiltonians which can be considered as the components of the momentum mapping associated with a torus action. We reduce the system via this momentum map and apply the geometric quantization scheme to its orbit manifold. In this way we obtain the energy levels along with the corresponding multiplicities. Finally, we point out that our considerations can be easily generalized giving in this way a new insight into the theory of representations of Lie groups in terms of Hamiltonian Mechanics. DOE

N92-27221*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
A GENERALIZED APPROACH TO THE THERMAL ANALYSIS OF THE LONG DURATION EXPOSURE FACILITY'S FLIGHT EXPERIMENTS Abstract Only
Thomas R. Sampair (Lockheed Engineering and Sciences Co., Hampton, VA.) and William M. Berrios *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 5 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N92-27499# Naval Postgraduate School, Monterey, CA.
AN EDUCATIONAL SPACE SEMINAR TO INCREASE AMERICAN STUDENT INTEREST IN SPACE CAREERS M.S. Thesis
Gregory A. Heruth, Sr. Sep. 1991 181 p
(AD-A246565) Avail: NTIS HC/MF A09

The ultimate goal of AMERICA'S YOUTH: Our Future In Space, an educational space seminar for college bound high school age students, is to inspire American youth with the wonders of Space, providing them with the desire to overcome obstacles and prepare themselves properly for a career in America's space program. The problem is discussed in three parts. First, studies show a decline in math and science capabilities and interest in science and engineering careers by America's youth. Second, with a decreasing population of high school age students, and an increasing number of 'Apollo era' experienced scientists and engineers retiring, the U.S. is faced with a serious supply and demand problem. Finally, the aerospace industry was the largest contributor to America's balance of trade for a number of years; unfortunately, international competition is quickly eroding the country's share of the world's commercial space 'pie'. A detailed review of four major space related educational programs designed for young people is provided. GRA

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N92-27440# Naval Postgraduate School, Monterey, CA.
IMPROVED CLASSIFIED MATERIAL CONTROL THROUGH THE APPLICATION OF A DATABASE MANAGEMENT SYSTEM M.S. Thesis
Terrance C. Brady Sep. 1991 143 p
(AD-A245376) Avail: NTIS HC/MF A07

Most military organizations maintain classified material, but, systems of accountability vary from one command to another. This thesis presents the design and implementation of a prototype database system, called COMMANDOC, that provides an automated method of tracking these documents including subcustody to a secondary control point, check out to an individual user, transfer to a new command, and destruction. All required reports are generated by the system. In addition to the information on the actual documents, the database contains information on the personnel authorized to use both the documents and to operate the system. This ensures that only personnel with the necessary access are allowed to check out documents. A password system ensures only authorized personnel utilize the system, and a weekly audit report of system users is provided to the supervisor. The system provides a simple menu interface that leads the user through each step of a transaction, and a user's manual is provided. GRA

N92-27518# MiTech, Inc., Washington, DC.
WORKSHOP ON INTEGRATED CREW RESOURCE MANAGEMENT (CRM) Final Report
Ronald John Lofaro, ed. May 1992 173 p Workshop held 19-21 Nov. 1991
(Contract DTFA01-90-Y-01009)
(DOT/FAA/RD-92/5) Avail: NTIS HC/MF A08

The continuing development and implementation of Crew Resource Management (CRM) training and assessment began in the late 1970's. There is interest in exploring paradigms and techniques which address an integrated, simultaneous assessment of CRM skills and the more traditional 'stick and rudder' (flight control) skills. A preliminary model for analysis and assessment in integrated CRM was developed. This paradigm, and its potential uses, were investigated by an Air Transport Association (ATA) of America focus group. The focus group was part of an ATA working group and subcommittee on Advanced Qualification Program (AQP). The workshop was designed and facilitated, and results prepared by, the Research Development Service. Author

N92-27523# Naval Postgraduate School, Monterey, CA.
DESIGN AND IMPLEMENTATION OF A MULTIMEDIA DBMS: MODIFICATION AND DELETION M.S. Thesis
Rosemary E. Stewart Sep. 1991 244 p
(AD-A246080) Avail: NTIS HC/MF A11

At the Naval Postgraduate School, computer science students are currently working on a multimedia database management (MDBMS) project. This prototype designed in 1988, has the ability to capture, store, manage, retrieve, and present both standard data, like alphanumerics and numerics, and media data. Media data in this thesis refers to graphics, signals, sound, and image and is stored using the abstract data type (ADT) concept. The MDBMS is built upon a conventional INGRES DBMS using ADT's. The multimedia database management system (MDBMS) can integrate audio, image, and formatted data so that these forms of data can process in the following ways: create tables, insert, delete, and retrieve. A complete database management system, requires deletion and modification operations to remove data already stored in a MDBMS or modify data in MDBMS storage. Formatted data is passed directly to INGRES for all types of processing. However, the inclusion of media data types in the MDBMS requires additional data structures and applications for modifying data that the INGRES catalog management cannot process directly. The special handling, SQL operations required to process data are discussed. This thesis concentrates on the design and implementation operations for deletion and modification of formatted and unformatted data in the MDBMS. Author (GRA)

N92-27526# Naval Postgraduate School, Monterey, CA.
DFQL: A GRAPHICAL DATAFLOW QUERY LANGUAGE M.S. Thesis
Gard J. Clark Sep. 1991 309 p
(AD-A246086) Avail: NTIS HC/MF A14

In nearly all large organizations, the Navy and Department of Defense being no exceptions, the use of database management systems (DBMS's) has become widespread. The prevailing data model for modern DBMS's is the relational model developed in the early 1970's. The relational model's superiority is due to its well thought out design and founding in mathematical logic. The de facto standard query language for relational DBMS's is IBM's Structured Query Language (SQL). Although SQL is the most widely used query language today, it has many problems, especially in the ease-of-use area. The purpose of this thesis is to design, implement, and test a new query language, DFQL, which will mitigate SQL's ease-of-use problems. DFQL provides a graphical query interface based on the dataflow paradigm in order to allow a user to easily and incrementally construct queries for a relational database. DFQL is relationally complete, maintains relational operational closure, and is designed to be easily extensible by the end user. DFQL was implemented on an Apple Macintosh using an ORACLE relational DBMS. A simple human factors experiment was performed in which DFQL's ease of query writing compared favorably to that of SQL. GRA

N92-27528# Naval Postgraduate School, Monterey, CA. Dept. of Administrative Sciences.
PROFILE OF AN EFFECTIVE ENGINEERING MANAGER M.S. Thesis
Kenneth W. Thomas, Susan P. Hocevar, Gail F. Thomas, and Frank J. Barrett Dec. 1991 43 p
(AD-A246525; NPS-AS-92-006) Avail: NTIS HC/MF A03

This study was designed to investigate the behavioral factors that determine the effectiveness of branch engineering managers at the Naval Avionics Center (NAC) in Indianapolis. Data were collected using a survey designed especially for this study. Ratings of effectiveness variables were obtained from both engineers (subordinates) and the division manager (superior) for each branch manager. Correlations were run between these effectiveness variables and specific managerial behaviors as rated by engineers in each branch. Somewhat different sets of behaviors or critical skill areas were found to be related to three different sets of effectiveness variables. A composite picture highlights the importance of the branch managers' communication activities and identifies four communication functions crucial to the effectiveness of the branch manager. These functions are (1) Listening and Responding to Branch Managers, (2) Providing Guidance to Branch Members, (3) Encouraging Collaboration Among Branch Members, and (4) Communicating the Needs of the Branch. This empirical data can be used as input for designing management development programs, selecting engineering managers, and conducting performance appraisals. GRA

N92-27552# Army Aviation Technical Test Center, Fort Rucker, AL.
METHODOLOGY INVESTIGATION: AVIATION TEST MANAGEMENT SYSTEM CONCEPT IMPLEMENTATION Final Report, Nov. 1990 - Jul. 1991
Robert L. Waters, Jr. and Robert L. Wise Jan. 1992 126 p
(AD-A247631) Avail: NTIS HC/MF A07

This report covers efforts to implement an automated project management system within an aviation research, development, test, and evaluation organization. This report details methodology used to outline the desired system and to move from a manual to an automated system. The ViewPoint software package from Computer Aided Management, Inc., was the main focus of the implementation. Problems with the software prevented full

implementation of the package. This report also includes a handbook on the use of ViewPoint in an appendix. GRA

N92-27553# Woods Hole Oceanographic Inst., MA.
SOFTWARE TOOLS FOR ACOUSTIC DATABASE MANAGEMENT
Kurt M. Fristrup, Mary A. Daher, Terrance J. Howald, and William A. Watkins Jan. 1992 90 p
(Contract N00014-88-K-0273)
(AD-A247636; WHOI-92-11) Avail: NTIS HC/MF A05

Digital archiving of bioacoustic data provides both curatorial and scientific benefits. To realize these benefits, key system requirements must be satisfied. This report discusses these requirements, and describes the software tools developed by the WHOI bioacoustic laboratory to maintain and utilize an archive of digitized biological sounds. These tools are written in standard C code, and are designed to run on PC-compatible microcomputers. Both the usage and structure of these programs are described in relation to the SOUND database of marine animal sounds. These tools include software for analog-to-digital conversion, text beader maintenance, data verification, and interactive spectrographic review. Source code listings are supplied. GRA

N92-27572*# Research Inst. for Computing and Information Systems, Houston, TX.
DETERMINING RULES FOR CLOSING CUSTOMER SERVICE CENTERS: A PUBLIC UTILITY COMPANY'S FUZZY DECISION
Andre deKorvin and Margaret F. Shipley (Houston Univ., Clear Lake, TX.) Feb. 1992 30 p
(Contract NCC9-16; RICIS Proj. SR-01)
(NASA-CR-190390; NAS 1.26:190390) Avail: NTIS HC/MF A03

In the present work, we consider the general problem of knowledge acquisition under uncertainty. A commonly used method is to learn by examples. We observe how the expert solves specific cases and from this infer some rules by which the decision was made. Unique to this work is the fuzzy set representation of the conditions or attributes upon which the decision make may base his fuzzy set decision. From our examples, we infer certain and possible rules containing fuzzy terms. It should be stressed that the procedure determines how closely the expert follows the conditions under consideration in making his decision. We offer two examples pertaining to the possible decision to close a customer service center of a public utility company. In the first example, the decision maker does not follow too closely the conditions. In the second example, the conditions are much more relevant to the decision of the expert. Author

N92-27590# Rochester Univ., NY. Dept. of Computer Science.
THE TRAINS PROJECT
J. F. Allen and L. K. Schubert May 1991 42 p
(AD-A247447; TR-382) Avail: NTIS HC/MF A03

The TRAINS project is a long-term research effort on building an intelligent planning assistant that is conversationally proficient in natural language. The TRAINS project serves as an umbrella for research that involves pushing the state of the art in real-time planning, planning in uncertain worlds, plan monitoring and execution, natural language understanding techniques applicable to spoken language, and natural language dialog and discourse modeling. Significant emphasis is being put on the knowledge representation issues that arise in supporting the tasks in the domain. This report describes the general goals of the TRAINS project and the particular research directions that we are pursuing. GRA

N92-27609*# National Aeronautics and Space Administration, Washington, DC.
ISSUES IN NASA PROGRAM AND PROJECT MANAGEMENT
Francis T. Hoban, ed. 1992 58 p
(NASA-SP-6101(05); NAS 1.21:6101(05)) Avail: NTIS HC/MF A04

This volume is the fifth in an ongoing series on aerospace project management at NASA. Articles in this volume cover: an overview of the project cycle; SE&I management for manned space flight programs; shared experiences from NASA Programs and Projects - 1975; cost control for Mariner Venus/Mercury 1973; and the Space Shuttle - a balancing of design and politics. A section on resources for NASA managers rounds out the publication. Author

N92-27665# Naval Postgraduate School, Monterey, CA.
DESIGN OF A GRAPHICAL USER INTERFACE FOR A MULTIMEDIA DBMS: QUERY MANAGEMENT FACILITY M.S. Thesis
Charles B. Peabody Sep. 1991 139 p
(AD-A246397) Avail: NTIS HC/MF A07

This thesis presents criteria and necessary features by which to evaluate and design a good graphical user interface (GUI) for a Multimedia Database Management System (MDBMS). This material is also applicable to a traditional DBMS. Included in the thesis is the specification for a Query Management Facility (QMF) for a MDBMS user interface. The nature and benefits of the GUI environment requires that we consider GUI concepts early in the user interface conceptualization and design. In today's DBMS user interfaces, these GUI concepts are for the most part applied as an afterthought. This is a critical mistake. Early incorporation of GUI capabilities along with established user interface principles results in a superior user interface. The QMF presented herein is one such interface. It combines the ideas of simple operations and data flow to allow the user to specify his query. Additional concepts used include: picture of the database schema, picture of the developing query, selectable objects, direct manipulation, piecemeal query specification, display of intermediate results and pre-defined joints. The resulting QMF is simple to use and enables the flexible expression of the simple as well as the complex database query. GRA

N92-27681# Naval Postgraduate School, Monterey, CA.
DESIGN AND IMPLEMENTATION OF A MULTIMEDIA DBMS: COMPLEX QUERY PROCESSING M.S. Thesis
Huseyin Aygun Sep. 1991 240 p
(AD-A247054) Avail: NTIS HC/MF A11

Traditional Database Management Systems (DBMS) are capable of managing only alphanumeric data. The Multimedia Database Management (MDBMS) Prototype started at the Computer Science Department of Naval PostgradSchool in 1988 made it possible to capture, store, manage, retrieve and present different media information such as image and sound by using the current, modem computer technology. In the existing MDBMS, if a query references only formatted data, it is passed to INGRES directly, but if a query includes media data, then the query is decomposed into multiple subqueries each of which must be individually processed, and the intermediate results of which must be recomposed to form the final result to be given to the user. This thesis will concentrate on complex queries involving nesting conditions and multiple selections which are not supported by the existing MDBMS prototype. GRA

N92-27703# Directorate of Scientific Information Services, Ottawa (Ontario).
TECHNOLOGY TRENDS, THREATS, AND OPPORTUNITIES (T(SUP 3)O). PART 4: PROCEEDINGS OF WORKSHOP ON CRITICAL ENABLING TECHNOLOGIES
J. G. G. Dionne, ed., R. W. MacPherson, ed., I. O. Moen, ed., B. D. Tannenbaum, ed., and J. Landolt, ed. (Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario) 1991 137 p Workshop held in Ottawa, Ontario, 15-17 Apr. 1991
(CTN-92-60495) Avail: NTIS HC/MF A07

A study was conducted to assess the technological environment in which the Canadian Forces will have to operate in the next 20-30 years, to indicate potential threats due to advances in technology, and to identify the opportunities that technology advances will offer for enhancing Canadian defense capabilities. The role of technology is put into context by examining defense and national security issues from a broader political and socio-economic perspective. A series of 25 future scenarios was prepared, each describing a hypothetical task that Canadian Forces

could be asked to carry out within the envisaged future scenarios. The scenarios were organized according to the mission they support (continental defense, collective defense and peacekeeping, support to civilian authorities) and the responsible environment (air, land, sea, and multi environmental). Under each environment, 8-13 key areas of research and development were identified, such as sensors, information and signal processing, human-machine interfaces, advanced materials, power sources and propulsion, and human protection. No fundamental technological breakthroughs were identified as critical for supporting the future scenarios. Systems and systems integration were recommended as a means for making more effective use of existing technologies, and to take advantage of new technology developments. CISTI

N92-27754# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.

THE ADVANCED TACTICAL FIGHTER EARLY, STRUCTURED, AND CONTINUOUS USER-INTERFACE PROCESS: A SYSTEM PROGRAM OFFICE/USER TEAM-BUILDING CONCEPT M.S. Thesis

Robert K. Barry Sep. 1991 153 p

(AD-A246641; AFIT/GSM/LSR/91S-3) Avail: NTIS HC/MF A08

The objective of this study was to develop an acquisition management tool that would improve the working relationship between the System Program Office (SPO) and the User during the Demonstration and Validation phase. It accomplished this by documenting the Advanced Tactical Fighter (ATF) Early, Structured, and Continuous (ESC) user-interface process in a draft handbook. This handbook was also developed to support a continuing Command-wide effort to improve the acquisition process. The study found that the ATF ESC process was also developed in response to senior Air Force management guidance, lessons learned, and ATF SPO management direction. The ATF ESC process was easily incorporated into the SPO's acquisition strategy, and it did not affect the current Tactical Air Force requirements process and the player's roles and responsibilities. The study recommended that the handbook be formalized and provided to other SPOs as a management tool for establishing an effective SPO-User relationship. GRA

N92-27824# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics

AN EXPERT SYSTEM FOR MEASURING, INTERPRETING, AND MANAGING SYSTEM PERFORMANCE FACTORS FOR THE WORK INFORMATION MANAGEMENT SYSTEM M.S. Thesis

Billy J. Irwin Dec. 1991 98 p

(AD-A246878; AFIT/GSS/LSM/91D-5) Avail: NTIS HC/MF A05

This study develops an expert system for measuring, interpreting, and managing the Wang VS operating system performance factors for the Work Information Management System. The system's performance concerns least known to system administrators are identified. Of these, SHARER buffers and VTOC cache are identified as factors that can significantly impact system performance with little effort. A six step process is used in developing the expert system. Concept maps representing the structure of the Wang VS Disk Input/Output problem domain are provided. The expert system provides information about the system parameters, SHARER buffers and VTOC cache, and recommends main memory allocations. The expert system is particularly useful to inexperienced system administrators. Sample executions of the system are provided. GRA

N92-27843*# National Aeronautics and Space Administration, Washington, DC.

DOING BUSINESS WITH NASA

[1991] 63 p Original contains color illustrations

(NASA-NP-151; NAS 1.83:151; ISBN-0-16-035949-X) Avail: NTIS HC/MF A04; 48 functional color pages

A brochure that was designed to encourage contractors to do business with NASA is presented. The brochure is divided into six sections: (1) This is NASA; (2) The procurement process; (3) Marketing your capabilities; (4) Special assistance programs; (5) NASA field installations; and (6) Sources of additional help. Author

N92-27928# General Accounting Office, Washington, DC. National Security and International Affairs Div.

SPACE STATION: CONTRACT OVERSIGHT AND PERFORMANCE PROVISIONS FOR MAJOR WORK PACKAGES. BRIEFING REPORT TO THE CHAIRMAN, SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT, COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY, HOUSE OF REPRESENTATIVES

Apr. 1992 11 p

(GAO/NSIAD-92-171BR; B-247885) Avail: NTIS HC/MF A03; also available from GAO, PO Box 6015 Gaithersburg, MD 20877 HC first copy free, additional copies $2.00

Selected aspects of NASA's management of the three work package contracts for Space Station Freedom are reviewed. Specifically reviewed is how NASA centers managing each of the contracts responded to Federal Acquisition Regulation (FAR) requirements for post award contract administration and quality assurance planning conferences and for quality assurance plan development, review, and approval. In addition, identified are the award fee provisions related to the performance of contractors' products. The results of the preliminary work were presented in a briefing on November 1991. This report updates and provides additional details on the information contained in that briefing. H.A.

N92-27972*# Computer Technology Associates, Inc., Rockville, MD.

ADVANCED SYSTEMS ENGINEERING AND NETWORK PLANNING SUPPORT Final Report, 20 Aug. - 21 Dec. 1990

David H. Walters, Larry K. Barrett, Ronald Boyd, Suresh Bazaj, Lionel Mitchell, and Fred Brosi 21 Dec. 1990 143 p

(Contract NAS5-30680)

(NASA-CR-189274; NAS 1.26:189274) Avail: NTIS HC/MF A07

The objective of this task was to take a fresh look at the NASA Space Network Control (SNC) element for the Advanced Tracking and Data Relay Satellite System (ATDRSS) such that it can be made more efficient and responsive to the user by introducing new concepts and technologies appropriate for the 1997 timeframe. In particular, it was desired to investigate the technologies and concepts employed in similar systems that may be applicable to the SNC. The recommendations resulting from this study include resource partitioning, on-line access to subsets of the SN schedule, fluid scheduling, increased use of demand access on the MA service, automating Inter-System Control functions using monitor by exception, increase automation for distributed data management and distributed work management, viewing SN operational control in terms of the OSI Management framework, and the introduction of automated interface management. Author

N92-27979# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.

ESTABLISHING A DEPARTMENT OF DEFENSE PROGRAM MANAGEMENT BODY OF KNOWLEDGE M.S. Thesis

Gregory D. Best Sep. 1991 129 p

(AD-A246625; AFIT/GSM/LSY/91S-5) Avail: NTIS HC/MF A07

This research project developed a common body of knowledge for the field of acquisition program management in the Department of Defense (DoD). The Defense Program Management Body of Knowledge (DBOK) is a compilation of all knowledge areas that a program manager must understand. Three methods were used to develop a hypothetical model DBOK: (1) an exhaustive review of project management literature; (2) curricula review of DoD acquisition management educational institutions; and (3) expert review. The hypothetical model was validated with a survey administered by the Project Management Institute to all directors and deputy directors of Major Defense Acquisition (Category I) programs in the DoD. Of 148 surveys mailed, 53 were returned for a response rate of 36 percent. The survey results prioritize all elements of the DBOK and identify acute training needs of the

respondents. The resulting DBOK is a validated knowledge baseline for the acquisition program management profession. As such, it is a suitable standard for accrediting DoD program management educational institutions that teach DoD program management, and for certification of program managers across the DoD. GRA

N92-27981# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
A STUDY OF THE AIR FORCE'S EXCEPTION MANAGEMENT PROCESS: ITS EFFECT ON CUSTOMER SERVICE AND ORDER PROCESSING M.S. Thesis
David W. Jones Sep. 1991 75 p
(AD-A246627; AFIT/GLM/LSM/91S-34) Avail: NTIS HC/MF A04

The purpose of this study was two-fold; the first goal was to determine what the SBSS order processing is, and secondly to determine the effect the current method of ECC management has on the SBSS order processing cycle and the level of customer service rendered by base supply. The research revealed that exception management is a crucial component of a successful order processing function. Further, it was established that the level of customer satisfaction experienced is greatly dependent upon good order processing. Research further indicated flaws in the current method of ECC management and recommended further actions to correct the current method of ECC management. The success of the SBSS order processing function is highly dependent upon a sound system of managing ECC images; however, the order processing functions do not need to be directly involved in the management of the ECCs. Rather, they require the ECC management function to merely keep their mainframe up-to-date with valid ECC information. This study is the first of its kind which links non-customer serving functions of Base Supply to the satisfaction level experienced by supply customers. GRA

N92-28083# Federal Aviation Administration, Washington, DC. Office of Aviation Medicine.
EFFECTS OF SUBORDINATE FEEDBACK TO THE SUPERVISOR AND PARTICIPATION IN DECISION-MAKING IN THE PREDICTION OF ORGANIZATIONAL SUPPORT Final Report
L. A. Witt and Chan Hellman Mar. 1992 9 p
(AD-A249125; DOT/FAA/AM-92/13) Avail: NTIS HC/MF A02

The present study tested the hypotheses that participation in decision-making (PDM) and perceived effectiveness of subordinate feedback to the supervisor would contribute unique variance in the prediction of perceptions of organizational support. In line with concerns for dispositional affect as a contributor to method variance and the possibility that biodata may explain some of the effects of PDM and feedback on support, dispositional affect, and biodata variables were included in the analyses. Hierarchical regression analyses, conducted on data collected from 1,083 Federal government workers, indicated that both feedback and PDM added unique variance to the prediction of support. These findings have implications for both management and research. GRA

N92-28156*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
GUIDELINES FOR THE DEVELOPMENT OF A PROJECT DATA MANAGEMENT PLAN (PDMP)
James L. Green and Joseph H. King Jul. 1988 31 p
(NASA-TM-107935; NAS 1.15:107935;
NSSDC/WDC-A-R/S-88-16) Avail: NTIS HC/MF A03

The purpose of this document is to assist NASA Project personnel in the preparation of their Project Data Management Plans (PDMP) in accordance with NASA Management Instruction (NMI) 8030.3A. In addition, this report summarizes the scope of a PDMP and establishes important aspects that must be addressed for the long term management and archiving of the data from a NASA space flight investigation. H.A.

N92-28172# Naval Postgraduate School, Monterey, CA.
STATISTICAL PROCESS CONTROL TECHNIQUES FOR THE TELECOMMUNICATIONS SYSTEMS MANAGER M.S. Thesis
Joseph W. Beadles, III and Lee W. Schonenberg Mar. 1992 108 p
(AD-A249122) Avail: NTIS HC/MF A06

The purpose of this thesis is to provide personnel, who are undergoing Total Quality Leadership (TQL) implementation at their telecommunications-related commands, an understanding of Statistical Process Controls (SPCs) and their potential application to telecommunication issues. Basic SPC tools common to all total quality programs are discussed. Advanced SPC methods including Analysis of Means (ANOM), Analysis of Variance (ANOVA) Weibull analysis and Taguchi methods are also presented. Selected SPC training programs of both the U.S. Navy and the commercial telecommunication industry are examined. A case study of a telecommunication-related issue is provided to demonstrate an integrated approach to the use of SPCs. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.

For computer documentation see *61 Computer Programming and Software.*

N92-27397*# Research Inst. for Computing and Information Systems, Houston, TX.
NASA TECHNOLOGY TRANSFER NETWORK COMMUNICATIONS AND INFORMATION SYSTEM: TUNS USER SURVEY
24 Feb. 1992 24 p Prepared in cooperation with Applied Expertise, Inc., Arlington, VA
(Contract NCC9-16; RICIS Proj. RB-04)
(NASA-CR-190385; NAS 1.26:190385) Avail: NTIS HC/MF A03

Applied Expertise surveyed the users of the deployed Technology Utilization Network System (TUNS) and surveyed prospective new users in order to gather background information for developing the Concept Document of the system that will upgrade and replace TUNS. Survey participants broadly agree that automated mechanisms for acquiring, managing, and disseminating new technology and spinoff benefits information can and should play an important role in meeting NASA technology utilization goals. However, TUNS does not meet this need for most users. The survey describes a number of systematic improvements that will make it easier to use the technology transfer mechanism, and thus expedite the collection and dissemination of technology information. The survey identified 26 suggestions for enhancing the technology transfer system and related processes. H.A.

N92-27496# Bhabha Atomic Research Centre, Bombay (India).
COMPRESSION AND DECOMPRESSION OF DIGITAL SEISMIC WAVEFORM DATA FOR STORAGE AND COMMUNICATION
Y. S. Bhadauria and Vijai Kumar (Bhabha Atomic Research Centre, Bombay, India) 1991 34 p
(DE92-621016; BARC-1549) Avail: NTIS HC/MF A03

Two different classes of data compression schemes, namely physical data compression schemes and logical data compression schemes are examined for their use in storage and communication of digital seismic waveform data. In physical data compression schemes, the physical size of the waveform is reduced. One, therefore, gets only a broad picture of the original waveform, when the data are retrieved and the waveform is reconstituted. Correlation between original and decompressed waveform varies inversely with the data compression ratio. In the logical data compression schemes, the data are stored in a logically encoded form. Storage of unnecessary characters like blank space is avoided. On decompression original data are retrieved and compression error is nil. Three algorithms of logical data compression schemes were developed and studied: (1) the optimum formatting scheme; (2) the differential bit reduction scheme; and (3) the six bit compression scheme. Results of the above three algorithms of logical compression class are compared with those of physical

compression schemes reported in literature. It is found that for all types of data, six bit compression scheme gives the highest value of data compression ratio. DOE

N92-27497# Bhabha Atomic Research Centre, Bombay (India).
EXPERT SYSTEM DEVELOPMENT (ESD) SHELL
S. Padmini, M. P. Diwakar, N. C. Rathode, and B. R. Bairi (Bhabha Atomic Research Centre, Bombay, India) 1991 44 p
(DE92-621018; BARC-1991/E/010) Avail: NTIS HC/MF A03

An Expert System Development (ESD) shell design implementation is described in detail. The shell provides high-level generic facilities for Knowledge Representation (KR) and inferencing and tools for developing user interfaces. A powerful set of tools in the shell relieves much of the programming burden in the ES development. The shell is written in PROLOG under IBM PC/AT. KR facilities are based on two very powerful formalisms namely, frames and rules. The inference Engine (IE) draws most of its power from unification and a backward reasoning strategy in PROLOG. This basic mechanism is enhanced further by incorporating both forward and backward chaining of rules and frame-based inferencing. Overall programming style integrates multiple paradigms including logic, object oriented, access-oriented, and imperative programming. This permits the ESD designer a lot of flexibility in organizing inference control. Creation and maintenance of a knowledge base is a major activity. The shell, therefore, provides a number of facilities to simplify these tasks. Shell design also takes note of the fact that final success of any system depends on end-user satisfaction and hence provides features to build user-friendly interfaces. The shell also provides a set of interfacing predicates so that it can be embedded within any PROLOG program to incorporate functionalilty of the shell in the user program. DOE

N92-27536# Logistics Management Inst., Bethesda, MD.
DOD IMPLEMENTATION GUIDELINES FOR ELECTRONIC DATA INTERCHANGE (EDI), VOLUME 1 Final Report
Morey M. Henderson and Ann P. Lewis Dec. 1991 134 p
(Contract MDA903-90-C-0006)
(AD-A246613; LMI-DL001-01R1) Avail: NTIS HC/MF A07

Electronic data interchange is the computer-to-computer exchange of routine digital business information in an agreed upon standard. It is commonplace in many private companies and promises to become the preferred method for conducting all business in the future. With the appropriate computer hardware, software, and communications, businesses can eliminate the tedious flow of paper purchase orders, invoices, shipping forms, technical specifications, and other documents and replace them with their electronic equivalents. These guidelines provide general guidance on the implementation of American National Standards Institute (ANSI) Accredited Standards Committee (ASC) X12 electronic data interchange (EDI) standards within automated information system (AIS) and information interchange procedures that require the collections, reporting, and/or exchange of data needed to perform Defense missions. The guidance is provided for two components. First, it may be used by organizational elements of the DoD community. It may also be useful to organizations external to DoD that exchange data with the DoD community in the course of their business relationships. Many of these organizations also engage in the planning, development, test and evaluation, standardization, implementation and/or maintenance of ANSI ASC X12 standards in automated system applications and associated information interchange procedures. GRA

N92-27860# Naval Weapons Center, China Lake, CA.
NATURAL LANGUAGE PROCESSING OF CAPTIONS FOR RETRIEVING MULTIMEDIA DATA Final Report, Jan. - Aug. 1991
Eugene L. Guglielmo and Neil C. Rowe Dec. 1991 19 p
(AD-A247780; NWC-TP-7203) Avail: NTIS HC/MF A03

This report describes the current implementation status of an intelligent information retrieval system, MARIE, that employs natural language processing techniques. Descriptive captions are used to identify photographic images concerning various military projects. The captions are written in a restricted form of English and consist mostly of descriptive noun phrases and nominal compounds. The captions are parsed to produce a logical form from which nouns and verbs are extracted to form the primary keywords. The keywords and the logical form together index the multimedia object. User queries are also specified in natural language. A two-phase search process is used to find the caption(s) that best match the query. A coarse-grain match process uses the logical form during semantic analysis, generating the keywords for use by the coarse-grain match process, setting inner case values and correlations between models, and performing the fine-grain matching. GRA

N92-27885# Naval Postgraduate School, Monterey, CA.
AN INFORMATION SYSTEMS ARCHITECTURE ANALYSIS FOR NAVAL AIR SYSTEMS COMMAND M.S. Thesis
Kamin A. Bell Mar. 1992 83 p
(AD-A247787) Avail: NTIS HC/MF A05

The Naval Air Systems Command (NAVAIR) is seeking to improve its information resource management (IRM) through the use of information systems (IS) architectures. Although several attempts have been made, NAVAIR currently has no overall IS plan. Enterprise Architecture Planning (EAP) is a comprehensive planning methodology that allows organizations to rapidly adapt and survive in dynamic environments. The use of EAP and the tools and resources currently available will provide NAVAIR with a strategic advantage in an era of diminishing resources. This thesis presents NAVAIR with an analysis of methodologies and tools which will prove useful in the development of an overall information systems architecture. GRA

N92-27911# Naval Postgraduate School, Monterey, CA.
VIDEO-TEXT PROCESSING BY USING MOTOROLA 68020 CPU AND ITS ENVIRONMENT M.S. Thesis
M. K. Hekimoglu Mar. 1991 148 p
(AD-A245775) Avail: NTIS HC/MF A07

The objective is to design a small, stand-alone microcomputer using the MC68020 CPU and its environment. It is dedicated to one of the most common jobs of microcomputers: Video-Text Generation. Therefore, it is called VTG (Video-Text Generator). VTG consists of a CPU (MC68020), CRT Controller (MC6845), and DUART (MC6868). The CRT Controller processes and generates the NTSC standard video-synchronization and video-text signals. The DUART accomplishes asynchronous serial communication with the keyboard unit and allows for the parallel communication via its parallel port, with peripherals. The VTG has four 32 KB of RAM for main memory and one 16 KB of RAM for the CRT Controller Refresh Memory. The system software and the initialization routine is saved in 32 KB of ROM. Memory management and the generation of chip control signals are accomplished by two PAL's (Programmable Logic Arrays) and two EPLD's (Erasable Programmable Logic Device). The CPU, PAL's, EPLD's, and memory chips in the VTG work at a speed of 8 MHz, while the CRT Controller works at 2 MHz. In addition, the system has a Video Synchronization and Multiplexing Unit which make it possible to synchronize the VTG's video-text signal with an external video signal. Accomplishing this, the system can place its text information into any NTSC standard video picture. To perform these jobs, the system does not need another microcomputer or aid. It can work as a stand-alone system. GRA

N92-27917# Naval Postgraduate School, Monterey, CA.
UNITED STATES COAST GUARD OPERATIONAL INFORMATION SYSTEMS: IMPROVING FUNCTIONALITY AND CROSS-FUNCTIONALITY M.S. Thesis
Peter S. Marsh Jun. 1991 135 p
(AD-A246900) Avail: NTIS HC/MF A07

The effective use of information can enable a public agency to better serve the taxpayers, or provide a crucial strategic advantage for a private sector firm. Present U.S. Coast Guard information systems do not provide information to all potential

users as effectively as they could. They suffer from several shortcomings: (1) poor connectivity, resulting in an awkward, torturous information flow which frequently does not provide information to people who need it; (2) significant overlap in content, resulting in increased workload and frustration for field personnel who enter data and data inconsistencies between applications; and (3) poor user interface designs, resulting in a situation where although information may be accessible to a user, it is difficult to retrieve and therefore not gotten. Cross-functional systems, based on a robust information architecture, offer the potential to dramatically improve information flow and availability within an organization. In the Coast Guard, the flow of operational information can be greatly improved by developing a cross-functional Operations Information System (OIS). Developing such a system is critical to continued effective service to the public, but may require changes in the ways in which systems are developed and funded. GRA

N92-27997# Mitre Corp., Bedford, MA.
PERFORMANCE PARAMETER METHODOLOGY UPDATE FOR INFORMATION DELIVERY TIMES Final Report
Barbara H. Roberts Mar. 1992 60 p
(Contract F19628-89-C-0001)
(AD-A248897; MTR-11194; ESD-TR-91-267) Avail: NTIS HC/MF A04

This report documents the development of a methodology for determining the overall information delivery time specifications for the Cheyenne Mountain Upgrade (CMU) from the individual subsystem transit time specifications. Since little is known about the transit time distribution of each subsystem, each is approximated by a rectangular distribution. Then these rectangular distributions are convolved to determine the distribution of the overall system performance parameter, information delivery time. When many rectangular distributions must be convolved, a simplification employing the Central Limit Theorem is used to estimate the mean and variance of the system's overall distribution. This distribution is thought to be close to normal with no negative tail. When rectangular distributions with large variance are used, errors in the resulting distribution can occur. These errors, introduced by the simplification technique, are reduced either by using numerical methods for convolving discrete distributions sampled from the continuous curve or, when less accuracy is required, by an approximation technique involving the convolution of two uniform distributions. A comparison of the numerical results derived from this approach with results calculated in a previous study is also presented. GRA

N92-28040# National Computer Security Center, Fort Meade, MD.
INTEGRITY IN AUTOMATED INFORMATION SYSTEMS Final Report
Terry Mayfield, J. E. Roskos, Stephen R. Welke, John M. Boone, and Catherine W. McDonald 16 Sep. 1991 147 p
(AD-A245555; NCSC-TR-79-91) Avail: NTIS HC/MF A07

For many years, the security research community has focused on the confidentiality aspect of security, and a solid analytical foundation for addressing confidentiality issues has evolved. Now it is recognized that integrity is at least as important as confidentiality in many computer systems; it is also apparent that integrity is not well understood. The purpose of this paper is to lay a foundation for understanding integrity and investigate how it can be promoted and preserved in computer systems. The paper begins by exploring what is meant by integrity. It identifies three primary sub goals of integrity: (1) prevent unauthorized users from accessing system resources or modifying data, (2) maintain traditional data consistency, as well as the consistency of a system with respect to its environment, and (3) prevent authorized users from improperly accessing system resources or modifying data. Having articulated a vision of integrity, the paper discusses principles underlying the preservation of integrity, analyzes manual and automated integrity-preserving mechanisms, and examines integrity models and proposed implementations of the models. The paper concludes that although some gaps in understanding still exist, it is possible to begin to standardize integrity properties of systems. GRA

N92-28112*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 3: THE IMPACT OF A SPONSOR LETTER ON MAIL SURVEY RESPONSE RATES
John M. Kennedy (Indiana Univ., Bloomington.) and Thomas E. Pinelli 1990 15 p Presented at the Annual Meeting of the American Association for Public Opinion Research, Lancaster, PA, May 1990
(NASA-TM-107923; NAS 1.15:107923) Avail: NTIS HC/MF A03

We describe the impact of two interventions in the design of mail surveys. The interventions were devised to increase response rates and to clarify sample eligibility. To test their effectiveness, the interventions occurred at different points in each of three surveys. One intervention was a letter from the research sponsor (NASA) supporting the research. The other intervention was the inclusion of a postcard that could be used by the respondent to indicate that the questionnaire was not appropriate for him/her. The sample was drawn from the membership of a professional aerospace research society, the American Institute for Aeronautics and Astronautics (AIAA). Scientists and engineers are difficult to survey for two reasons. First, there are significant problems with the definition of scientists and engineers. Second, typically there are low response rates in surveys of this group. These two problems were found in the NASA surveys. The results indicate that the sponsor letter improved response rates under certain conditions described here. The postcards assisted in identifying non-eligible persons, particularly when the postcards accompanied a pre-survey letter. The implications for survey costs are discussed. Author

N92-28113*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 8: THE ROLE OF THE INFORMATION INTERMEDIARY IN THE DIFFUSION OF AEROSPACE KNOWLEDGE
Thomas E. Pinelli, John M. Kennedy, and Rebecca O. Barclay (Rensselaer Polytechnic Inst., Troy, NY.) 1990 24 p Repr. from Science and Technology Libraries, v. 11, no. 2, 1990 p 59-76
(NASA-TM-107949; NAS 1.15:107949; AD-A251966) Avail: NTIS HC/MF A03

The United States aerospace industry is experiencing profound changes created by a combination of domestic actions and circumstances such as airline deregulation. Other changes result from external trends such as emerging foreign competition. These circumstances intensify the need to understand the production, transfer, and utilization of knowledge as a precursor to the rapid diffusion of technology. Presented here is a conceptual framework for understanding the diffusion of technology. A conceptual framework is given for understanding the diffusion of aerospace knowledge. The framework focuses on the information channels and members of the social system associated with the aerospace knowledge diffusion process, placing particular emphasis on aerospace librarians as information intermediaries. Author

N92-28114*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 13: THE INFORMATION-SEEKING HABITS AND PRACTICES OF ENGINEERS
Thomas E. Pinelli 1991 22 p Repr. from Science and Technology Libraries, v. 11, no. 3, 1991 p 5-25
(NASA-TM-107931; NAS 1.15:107931; AD-A251967) Avail: NTIS HC/MF A03

It is argued that only by maximizing the research and development process can the United States maintain and possibly capture its international competitive edge. Key to this goal is the

provision of information services and products which meet the information needs of engineers. Evidence exists which indicates that traditional information services and products may, in fact, not be meeting the information needs of engineers. The primary reason for this deficiency is three fold. First, the specific information needs of engineers are neither well known nor well understood. Second, what is known about the information seeking habits and practices of engineers has not been applied to existing engineering information services. Third, the information professionals continue to over-emphasize technology instead of concentrating on the quality of the information itself and the ability of the information to meet the needs of the user. Author

N92-28115*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 17: THE RELATIONSHIP BETWEEN SEVEN VARIABLES AND THE USE OF US GOVERNMENT TECHNICAL REPORTS BY US AEROSPACE ENGINEERS AND SCIENTISTS

Thomas E. Pinelli, Rebecca O. Barclay, John M. Kennedy, Nanci Glassman, and Loren Demerath (Indiana Univ., Bloomington.) 1991 10 p Presented at the 54th Annual Meeting of the American Society for Information Science, Washington, DC, 30 Oct. 1991

(Grant NAGw-1682)

(NASA-TM-107950; NAS 1.15:107950) Avail: NTIS HC/MF A02

A study was undertaken to investigate the relationship between the use of U.S. government technical reports by U.S. aerospace engineers and scientists and seven selected sociometric variables. Data were collected by means of a self-administered mail survey which was distributed to a randomly drawn sample of American Institute of Aeronautics and Astronautics (AIAA) members. Two research questions concerning the use of conference meeting papers, journal articles, in-house technical reports, and U.S. government technical reports were investigated. Relevance, technical quality, and accessibility were found to be more important determinants of the overall extent to which U.S. government technical reports and three other information products were used by U.S. aerospace engineers and scientists. Author

N92-28116*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 15: TECHNICAL COMMUNICATIONS IN THE INTERNATIONAL WORKPLACE: SOME IMPLICATIONS FOR CURRICULUM DEVELOPMENT

Rebecca O. Barclay, Thomas E. Pinelli, Michael L. Keene, John M. Kennedy, and Myron Glassman (Old Dominion Univ., Norfolk, VA.) Aug. 1991 13 p Repr. from Technical Communications, v. 38, no. 3, Aug. 1991 p 324-335

(NASA-TM-107926; NAS 1.15:107926; AD-A252057) Avail: NTIS HC/MF A03

Reported here are the results of a survey of European and U.S. aerospace engineers concerning the kinds of communication products that engineers actually use, the kinds they produce, and the recommendations they would offer designers of academic courses. Specific means to bridge the gap between classroom and workplace; relevant faculty work and educational background, advisory boards, professional contacts, research, and feedback are covered. Author

N92-28117*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 22: ESTABLISHING A RESEARCH AGENDA FOR SCIENTIFIC AND TECHNICAL INFORMATION (STI): FOCUS ON THE USER

Thomas E. Pinelli 1992 12 p Presented at the Research Agenda in Information Science Workshop, Lisbon, Portugal, 7-9 Apr. 1992; sponsored by AGARD

(NASA-TM-107930; NAS 1.15:107930) Avail: NTIS HC/MF A03

The goal is the creation of a generally accepted, systematically developed and implemented, but user focused, research agenda for the Advisory Group for Aerospace Research and Development (AGARD) and the Technical Information Panel (TIP) member countries. Information use seldom exists as an isolated incident. Information use usually takes place within organizational and interpersonal contexts. Therefore, it should not be studied in isolation, but rather in an holistic environment. Once implemented, this research agenda could be completed within 3 to 5 years. The results would be generalizable to AGARD member nations, would form the basis for the development of theory based practice, and would form a significant body of knowledge that can be used by AGARD information professionals for policy, practice, product, and systems development. Author

N92-28149# Office of Management and Budget, Washington, DC.

IMPROVING THE IMPACT OF FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION: A CALL FOR ACTION

David Gold 15 May 1992 32 p

Avail: NTIS HC/MF A03

Through its billions of dollars in expenditures on research and development (R&D), the US Federal Government generates more scientific and technical information (STI) than any other single source in the world. Federal STI represents a product and direct benefit of the over $70 billion in annual Federal R&D expenditures. How the Federal Government goes about making this information available for use has a direct and very significant impact on the ability of the billions of dollars in R&D expenditures to promote US competitiveness, enhance science and math education, and advance the US science base. An effort to build a strong case in support of the position that the issues confronting the Federal STI system are critically important to the US and that administration leadership in coordinating STI is needed is presented. Author

N92-28155*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 20: ENGINEERS AS INFORMATION PROCESSORS: A SURVEY OF US AEROSPACE ENGINEERING FACULTY AND STUDENTS

Maurita Peterson Holland, Thomas E. Pinelli, Rebecca O. Barclay, and John M. Kennedy (Indiana Univ., Bloomington.) 1991 20 p Repr. from European Journal of Engineering Education, v. 16, no. 4, 1991 p 317-336

(Grant NAGw-1682)

(NASA-TM-107928; NAS 1.15:107928) Avail: NTIS HC/MF A03

U.S. aerospace engineering faculty and students were surveyed as part of the NASA/DoD Aerospace Knowledge Research Project. Faculty and students were viewed as information processors within a conceptual framework of information seeking behavior. Questionnaires were received from 275 faculty members and 640 students, which were used to determine: (1) use and importance of information sources; (2) use of specific print sources and electronic data bases; (3) use of information technology; and (4) the influence of instruction on the use of information sources and the products of faculty and students. Little evidence was found to support the belief that instruction in library or engineering information use has significant impact either on broadening the frequency or range of information products and sources used by U.S. aerospace engineering students. Author

N92-28183*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 14: AN ANALYSIS OF THE TECHNICAL COMMUNICATIONS PRACTICES REPORTED BY ISRAELI AND US AEROSPACE ENGINEERS AND SCIENTISTS

Rebecca O. Barclay, Thomas E. Pinelli, David Elazar, and John M. Kennedy (Indiana Univ., Bloomington.) 1991 18 p Presented at the International Professional Communication Conference, Orlando, FL, 1 Nov. 1991

(NASA-TM-107924; NAS 1.15:107924) Avail: NTIS HC/MF A03

As part of Phase 4 of the NASA/DoD Aerospace Knowledge

Diffusion Research Project, two pilot studies were conducted that investigated the technical communications practices of Israeli and U.S. aerospace engineers and scientists. Both studies had the same five objectives: first, to solicit the opinions of aerospace engineers and scientists regarding the importance of technical communications to their profession; second, to determine the use and production of technical communications by aerospace engineers and scientists; third, to seek their view about the appropriate content of an undergraduate course in technical communications; fourth, to determine aerospace engineers' and scientists' use of libraries, technical information centers, and on-line databases; and fifth, to determine the use and importance of computer and information technology to them. A self-administered questionnaire was mailed to randomly selected U.S. aerospace engineers and scientists who are working in cryogenics, adaptive walls, and magnetic suspension. A slightly modified version was sent to Israeli aerospace engineers and scientists working at Israel Aircraft Industries, LTD. Responses of the Israeli and U.S. aerospace engineers and scientists to selected questions are presented in this paper. Author

N92-28184*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 21: TECHNOLOGICAL INNOVATION AND TECHNICAL COMMUNICATIONS: THEIR PLACE IN AEROSPACE ENGINEERING CURRICULA. A SURVEY OF EUROPEAN, JAPANESE, AND US AEROSPACE ENGINEERS AND SCIENTISTS
Thomas E. Pinelli, Rebecca O. Barclay, Maurita Peterson Holland, Michael L. Keene, and John M. Kennedy (Indiana Univ., Bloomington.) 1991 16 p Repr. from European Journal of Engineering Education, v. 16, no. 4, 1991 p 337-351
(Grant NAGw-1682)
(NASA-TM-107929; NAS 1.15:107929) Avail: NTIS HC/MF A03

Aerospace engineers and scientists from Western Europe, Japan, and the United States were surveyed as part of the NASA/DoD Aerospace Knowledge Diffusion Research Project. Questionnaires were used to solicit their opinions regarding the following: (1) the importance of technical communications to their profession; (2) the use and production of technical communications; and (3) their views about the appropriate content of an undergraduate course in technical communications. The ability to communicate technical information effectively was very important to the aerospace engineers and scientists who participated in the study. A considerable portion of their working week is devoted to using and producing technical information. The types of technical communications used and produced varied within and among the three groups. The type of technical communication product used and produced appears to be related to respondents' professional duties. Respondents from the three groups made similar recommendations regarding the principles, mechanics, and on-the-job communications to be included in an undergraduate technical communications course for aerospace majors. Author

N92-28186*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SPAN: OCEAN SCIENCE
Valerie L. Thomas, Chester J. Koblinsky, Ferris Webster, Victor Zlotnicki (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and James L. Green Jan. 1987 15 p
(NASA-TM-107939; NAS 1.15:107939;
NSSDC/WDC-A-R/S-87-05) Avail: NTIS HC/MF A03

The Space Physics Analysis Network (SPAN) is a multi-mission, correlative data comparison network which links space and Earth science research and data analysis computers. It provides a common working environment for sharing computer resources, sharing computer peripherals, solving proprietary problems, and providing the potential for significant time and cost savings for correlative data analysis. This is one of a series of discipline-specific SPAN documents which are intended to complement the SPAN primer and SPAN Management documents. Their purpose is to provide the discipline scientists with a comprehensive set of documents to assist in the use of SPAN for discipline specific scientific research. H.A.

N92-28188*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
MANAGEMENT OF THE SPACE PHYSICS ANALYSIS NETWORK (SPAN)
James L. Green, Valerie L. Thomas, Todd F. Butler, David J. Peters, and Patricia L. Sisson (Science Applications Research, Lanham, MD.) Jan. 1990 31 p
(NASA-TM-107934; NAS 1.15:107934;
NSSDC/WDC-A-R/S-89-23) Avail: NTIS HC/MF A03

Here, the purpose is to define the operational management structure and to delineate the responsibilities of key Space Physics Analysis Network (SPAN) individuals. The management structure must take into account the large NASA and ESA science research community by giving them a major voice in the operation of the system. Appropriate NASA and ESA interfaces must be provided so that there will be adequate communications facilities available when needed. Responsibilities are delineated for the Advisory Committee, the Steering Committee, the Project Scientist, the Project Manager, the SPAN Security Manager, the Internetwork Manager, the Network Operations Manager, the Remote Site Manager, and others. Author

N92-28211*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 19: COMPUTER AND INFORMATION TECHNOLOGY AND AEROSPACE KNOWLEDGE DIFFUSION
Thomas E. Pinelli, John M. Kennedy, Rebecca O. Barclay, and Ann P. Bishop (Illinois Univ., Urbana-Champaign.) 1992 23 p Presented at the Annual Meeting of the American Association for the Advancement of Science (AAAS), Chicago, IL, 8 Feb. 1992
(NASA-TM-107927; NAS 1.15:107927) Avail: NTIS HC/MF A03

To remain a world leader in aerospace, the US must improve and maintain the professional competency of its engineers and scientists, increase the research and development (R&D) knowledge base, improve productivity, and maximize the integration of recent technological developments into the R&D process. How well these objectives are met, and at what cost, depends on a variety of factors, but largely on the ability of US aerospace engineers and scientists to acquire and process the results of federally funded R&D. The Federal Government's commitment to high speed computing and networking systems presupposes that computer and information technology will play a major role in the aerospace knowledge diffusion process. However, we know little about information technology needs, uses, and problems within the aerospace knowledge diffusion process. The use of computer and information technology by US aerospace engineers and scientists in academia, government, and industry is reported. Author

N92-28220*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT. PAPER 16: AEROSPACE KNOWLEDGE DIFFUSION RESEARCH
Thomas E. Pinelli, John M. Kennedy, Rebecca O. Barclay, Terry F. White (Indiana Univ., Bloomington.), and Ray Jones, ed. London, England Sterling Publications International Ltd. 1991 7 p Repr. from World Aerospace Technology 1991: The International Review of Aerospace Design and Development (London, England), v. 1, 1991 p 31-34
(NASA-TM-107925; NAS 1.15:107925; ISSN-0959-0846)
Copyright Avail: NTIS HC/MF A02

The project is a cooperative US effort between NASA, DoD, and Indiana University. This research was endorsed by the AGARD Technical Information Panel and the American Institute of Aeronautics and Astronautics (AIAA) Technical Information Committee. The four-phase inquiry focuses on scientific and

technical information (STI) as knowledge, the channels through which this knowledge is communicated, and the members of the social system associated with and involved in diffusing this knowledge throughout the aerospace community. The project is based on two premises: (1) although STI is essential to innovation, STI by itself does not ensure innovation; and (2) utilizing existing STI or creating new STI, does often facilitate technological innovation. The topics covered include the following: information-seeking habits, knowledge transfer, academic sector, non-US organizations, present status, comparative study, and timetable. Author

N92-27222*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ENVIRONET: AN ON-LINE ENVIRONMENT DATA BASE FOR LDEF DATA Abstract Only
Michael Lauriente *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 6 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27227*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
COLLECTION, ANALYSIS, AND ARCHIVAL OF LDEF ACTIVATION DATA Abstract Only
C. E. Laird (University of Eastern Kentucky, Richmond.), B. A. Harmon, G. J. Fishman, and T. A. Parnell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 13 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27270*# Boeing Co., Seattle, WA. Defense and Space Group.
DATABASES FOR LDEF RESULTS Abstract Only
Gail Bohnhoff-Hlavacek *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 64 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27271*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
MATERIALS AND PROCESSES TECHNICAL INFORMATION SYSTEM (MAPTIS) LDEF MATERIALS DATABASE Abstract Only
John M. Davis and John W. Strickland (BAMSI, Inc., Huntsville, AL.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 65 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27324*# Schafer (W. J.) Associates, Inc., Washington, DC.
LDEF ARCHIVAL SYSTEM PLAN Abstract Only
Brenda K. Wilson *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 125 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N92-28042# Dawnbreaker, Rochester, NY.
BUSINESS PLANNING FOR SCIENTISTS AND ENGINEERS
J. C. Servo and P. D. Hauler Mar. 1992 167 p
(Contract DE-FG05-89ER-80688)
(DE92-010381; DOE/ER-0538T) Avail: NTIS HC/MF A08

Business Planning for Scientists and Engineers is a combination text/workbook intended for use by individuals and firms having received Phase 2 SBIR funding (Small Business Innovation Research). It is used to the best advantage in combination with other aspects of the Commercialization Assistance Project developed by Dawnbreaker for the US Department of Energy. Although there are many books on the market which indicate the desired contents of a business plan, there are none which clearly indicate how to find the needed information. This book focuses on the how of business planning: how to find the needed information; how to keep yourself honest about the market potential; how to develop the plan; how to sell and use the plan. DOE

84 LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see also *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

No abstracts in this category.

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

N92-27636 California Univ., Berkeley.
A STUDY OF BOWEN FLUORESCENCE IN ACCRETION-POWERED SOURCES Ph.D. Thesis
Jonathan Schachter 1990 283 p
Avail: Univ. Microfilms Order No. DA9126766

The O III Bowen fluorescence lines (the strongest at 3133, 3444, and 3299 A) result from the trapping of He II Ly alpha (lambda 303.782) photons by the nearly coincident O III 2p(exp 2) - 2pd3 transition at 303.799 A. The probability of producing a Bowen cascade per He II Ly alpha photon (the Bowen yield) is sensitive to the line-center optical depth in He II Ly alpha (tau L). If the He II line spectrum is produced by case B recombination, then I Ly alpha varies as I(sub 3204), where I(sub 3204) is the intensity of lambda 3204 (He II Pa beta). In this case, the yield may be measured directly from I(sub 3133)/I(sub 3204). The tau L constraint may be used together with the I(sub 3204) to estimate the size and density of the Bowen emission-line region (ELR). In accretion-powered sources, these estimates may provide important insights into the structure of the Bowen ELR. For this reason, I have conducted the first systematic study of Bowen emission in x-ray binaries, active galactic nuclei, and cataclysmic variables. This dissertation reports the results of the analysis for the low-mass

x-ray binary Scorpius X-1, a sample of 8 Seyfert galaxy nuclei, and 2 AM Herculis stars. In Sco X-1, the Bowen ELR appears to be the outer, low-density fringe of a denser structure, located within the Roche lobe of the neutron star. The Bowen ELRs of the Seyfert nuclei appear to consist of many small clouds, with a small filling factor. For the AM Her stars, where the He II line spectrum is not well approximated by case B recombination, the observed He II and Bowen line intensities provide constraints on the Bowen ELR. I find that this ELR has a characteristic size significantly smaller than the size of the white dwarf's Roche lobe, although the density is not very well constrained. Dissert. Abstr.

N92-27644# Toronto Univ. (Ontario). Dept. of Astronomy.
A STUDY OF THE DIFFUSE INTERSTELLAR MEDIUM THROUGH NEUTRAL HYDROGEN ABSORPTION OBSERVATIONS TOWARD PULSARS Ph.D. Thesis
Dale A. Frail 29 Sep. 1989 152 p
(ISBN-0-315-54703-0; CTN-92-60465) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Neutral hydrogen absorption measurements at 21 cm have been made toward 20 pulsars with the Arecibo 305 m telescope in Arecibo, Puerto Rico and the 27 element interferometer (VLA) in Socorro, New Mexico. Two novel data acquisition methods were developed to collect this data. The Arecibo system is a general purpose pulsar observing system with asynchronous sampling for full resolution over a pulsar period. The single gating window design developed at the VLA is the first of its kind to make pulsar observations in spectral line mode using a connected element interferometer. Distances are derived using the 21 cm absorption and emission spectra toward each pulsar in conjunction with a Galactic rotation curve. The pulsars were chosen to be especially well suited to studying the electron density at low galactocentric radii. Models for the distribution of the free electron density are poorly determined in this region. The data show a clear rise in the electron density in the inner Galaxy, to about three times the local average. The rise is consistent with O stars being the principal ionizing agent of the diffuse interstellar medium. Monte-Carlo simulations were performed on the complete dataset in order to determine model parameters for the electron distribution. Smooth exponential disk models were found to be only partially successful in fitting the data. An observational selection effect and a large scatter inherent in the data limit the usefulness of this approach. Nearby HII regions are responsible for some of the observed scatter in the electron density measurements. However, a non-uniform, clumpy ionized medium is required to explain the remaining observations. Author (CISTI)

N92-27651*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
MULTI-USE LUNAR TELESCOPES
Mark Drummond, Butler Hine, Russell Genet, David Genet, David Talent, Louis Boyd, Mark Trueblood (Winer Mobile Observatory, Tucson, AZ.), and Alexei V. Filippenko, ed. Oct. 1991 21 p
(NASA-TM-107908; NAS 1.15:107908; FIA-91-31) Avail: NTIS HC/MF A03

The objective of multi-use telescopes is to reduce the initial and operational costs of space telescopes to the point where a fair number of telescopes, a dozen or so, would be affordable. The basic approach is to develop a common telescope, control system, and power and communications subsystem that can be used with a wide variety of instrument payloads, i.e., imaging CCD cameras, photometers, spectrographs, etc. By having such a multi-use and multi-user telescope, a common practice for earth-based telescopes, development cost can be shared across many telescopes, and the telescopes can be produced in economical batches. Author

N92-27684# Toronto Univ. (Ontario). Dept. of Astronomy.
THE INCIDENCE AND NATURE OF ABSORPTION LINE PROFILE VARIATIONS AMONG THE O STARS Ph.D. Thesis
Alexander William Fullerton 5 Jan. 1990 548 p
(ISBN-0-315-56945-X; CTN-92-60477) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

A spectroscopic survey was conducted of a magnitude limited sample of O stars to search for absorption line profile variations, particularly those that are commonly attributed to nonradial pulsations. The final sample consisted of 32 stars with spectral types between O 4 and O 9.7 that covered the full range of luminosity classes. Through the use of an objective statistical technique significant variations were detected in the shapes and strengths of the lines for 75 +/- 15 percent (24/32) of the sample. The incidence of variability appears to be primarily a function of luminosity: all the supergiants in the sample exhibited line profile variations, while 7 of the 8 constant stars are dwarfs. Similarly, the amplitude of the line profile variations appears to correlate positively with indicators of luminosity, though the correlations are suggestive rather than definitive. No dwarf earlier than O 8 exhibited variations in the data. The large-amplitude variations observed in the line profiles of supergiant stars were associated with the formation and evolution of overdense structures in their stellar winds. For stars of lower luminosity, the line profile variations could be due to pulsation, rotational modulation, or the evolution of structures in the stellar wind. However, the variability of one of these objects, HD 34656, is almost certainly due to radial pulsation. This discovery constitutes direct proof that O-type stars are pulsationally unstable. Author (CISTI)

N92-27686# Victoria Univ. (British Columbia).
CLUSTERING OF FAINT GALAXIES Ph.D. Thesis
Leopoldo Infante 1990 162 p
(ISBN-0-315-53743-4; CTN-92-60479) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

A study is presented of the clustering of faint galaxies, and constraints on the evolution of clustering at large look-back times are derived. A new catalogue of faint galaxies has been compiled from 9 prime focus plates taken with the Canada - France - Hawaii 3.6 m telescope; this catalogue covers a 2.2 square degree area near the North Galactic Pole. The plates were scanned with the Automatic Plate Machine (APM) in Cambridge, UK, and photometric and structural parameters were derived for all stars and galaxies on the plates. Galaxy counts and color distributions were obtained from these catalogues. The colors show a tendency for fainter galaxies to become bluer. No significant field-to-field variations were found in the number counts. The angular correlation function, omega(theta), was obtained as a function of magnitude, surface brightness index, and color. The most important results are as follows. (1) The slope in omega(theta) decreases towards fainter limiting magnitudes. (2) The amplitude obtained (when a power law with a slope of 0.8 is fitted to the small separation data) increases towards brighter limiting magnitudes. (3) The power law behavior of omega(theta) breaks at angles which decrease with limiting magnitude. (4) In the surface brightness analysis a trend is found such that the logarithmic slope of omega(theta) is steeper for higher surface brightness galaxies. (5) A tendency was found for omega(theta) for blue galaxies to break from a power law at smaller separations than for red galaxies. These results are consistent with a picture where there is evolution of clustering (galaxies were less clustered in the past) and with the existence of a scale size beyond which the Universe becomes homogeneous. Author (CISTI)

N92-27700# Queens Univ., Kingston (Ontario). Dept. of Physics.
IDENTIFICATION AND STUDY OF HII REGIONS IN THE IRAS POINT SOURCE CATALOG Ph.D. Thesis
Gordon Curtis MacLeod Sep. 1990 225 p
(ISBN-0-315-61537-0; CTN-92-60484) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Criteria are presented which identify 2298 objects in the Infrared Astronomical (IRAS) Satellite Point Source Catalog, of which 77 percent are estimated to be HII regions. The 2298 point sources are then used to study the structure of the Milky Way. The results of this study confirm the notion that the galactic plane undulates about a mean plane and that the sun is positioned above the mean plane. A simple model is derived to explain the range of infrared spectral shapes of the IRAS point sources. It is found that a model with a stellar source at the center of a small (less than 1-2 pc in radius) dust cloud, where the average temperature of the cloud is varied, can explain the range of shapes of the IRAS spectra. In this model a power-law dependence on radius is assumed for both temperature and gas (and dust) density. The model predicts that embedded early B type stars will have steeper IRAS spectra than embedded O type stars under similar cloud conditions. Radio observations of 8 of the 24 IRAS sources with the steepest spectra were taken to determine the spectral type(s) of the exciting star(s). Using this data, other radio data from the literature, and estimated distances to the sources, the spectral types of 14 IRAS point sources with steep infrared spectra are determined. Author (CISTI)

90 ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

For related information see also *75 Plasma Physics*.

N92-27611# Toronto Univ. (Ontario).
TOPICS IN GALACTIC DYNAMICS Ph.D. Thesis
Frank Blane Little 31 Jan. 1989 137 p
(ISBN-0-315-47774-1; CTN-92-60466) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The distant satellites of the Milky Way Galaxy are used to probe the distribution of dark matter in the Galactic halo. A new method of statistical analysis based on Bayes' theorem was devised, which directly yields confidence intervals for the mass of the Galaxy once the eccentricity distribution of the satellites is specified. Assuming an isotropic velocity distribution for 10 objects at distances of 50 to 140 kiloparsecs, mass results suggest that the Galaxy's massive dark halo extends to approximately less than 50 kiloparsecs from the Galactic center. A model galaxy with an artificial bar is used to explore the effect of dynamical friction on a galactic bar. An analytic formula is provided which correctly predicts angular momentum changes for a bar in interaction with a non self-gravitating disk. N-body simulations further show that disk self-gravity tends to make a bar without inner Lindblad resonances spin down more rapidly, and tends to make a bar dominated by inner Lindblad resonances spin up less rapidly. The long-term dynamical evolution of galactic bars is investigated using fully self gravitating bar-unstable disk-halo models. The models develop rapidly rotating bars which then slow down through transfers of angular momentum both to the outer disk and to the halo. The models suggest that the distance between the end of a bar and its corotation circle is proportional to the bar's age, and an approximate formula is presented which expresses this relationship. It is also concluded that the average tangential velocity within a barlike object drops by a factor of about 2 over approximately 45 initial rotation periods.
Author (CISTI)

N92-27623# British Columbia Univ., Vancouver.
BIRTH OF UNIVERSES WITH NON-MINIMAL COUPLING Ph.D. Thesis
Redouane Fakir Mar. 1989 111 p
(ISBN-0-315-55826-1; CTN-92-60464) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Models of cosmological inflation are plagued with a severe and seemingly unavoidable problem: in order to produce density perturbations of an amplitude consistent with large-scale observations, the self-coupling lambda of the inflation field has to be tuned to an excessively small value. In all these models, however, the scalar field is taken to be minimally coupled to the scalar curvature (the curvature coupling theta is set to zero). It is shown that in the more general case of non-minimal coupling (theta does not equal zero), and within the framework of Linde's chaotic inflation, the constraint on the self-coupling can be relaxed by several orders of magnitude. This stems essentially from the fact that, contrary to common belief, the curvature coupling theta can be almost arbitrarily large without upsetting the inflationary scenario. Non-minimal coupling may thus provide a relatively simple solution to the long-standing problem of excessive density perturbations in inflationary models. The possibility of inflation during induced gravity spontaneous symmetry breaking with Zee's Lagrangian is confirmed. The ordinary and chaotic versions of this model are compared and found to differ substantially regarding the constraints on initial conditions and field parameters. The minisuperspace canonical quantization is applied, where the usual assumption of minimal coupling between the curvature and the scalar field is dropped. It is shown that the generic features of Vilenkin's, and Hartle and Hawking's wave functions are preserved in non-minimal coupling. Author (CISTI)

N92-27640 Columbia Univ., New York, NY.
AN X RAY IMAGE OF THE LARGE MAGELLANIC CLOUD AND A STUDY OF ITS HOT INTERSTELLAR MEDIUM Ph.D. Thesis
Qingde Wang 1990 180 p
Avail: Univ. Microfilms Order No. DA9127999

We present a comprehensive re-analysis of the Einstein Observatory imaging survey of the Large Magellanic Cloud. Techniques necessary for the study of diffuse x-rays are described in detail. A discrete source search of an approx. 37 deg(exp 2) region in the vicinity of the LMC reveals 105 sources, 33 of which are reported here for the first time. Subtraction of all discrete emitters reveals extensive diffuse x-ray emission with a luminosity of approx. 2 x 10(exp 38) erg S(exp -1) associated with the Cloud. The spectrum of this emission, well fitted by an optically thin thermal plasma, reveals a temperature range from approx. 10(exp 6) K in the western part of the galaxy to approx. 10(exp 7) K in the vicinity of the active star formation complex near 30 Doradus. An anticorrelation of HI and diffuse x-rays on scales of approx. less than 1 kpc is consistent with a picture in which superbubbles of hot gas are created in the neutral ISM by the combined action of stellar winds and supernovae in massive stellar associations. Estimates of the cooling and heating rates for the hot gas suggest that a substantial fraction of the energy input from stellar winds and supernovae either radiates in other wavelength bands or leaves the galaxy in the form of a wind. Combining our x-ray survey with the information derived from observations in other wavelength bands, we assess the physical condition of the hot gas in the Cloud. In particular, we show that the detection of two dozen x-ray bright OB associations is consistent with a scenario in which recent supernovae enhance the x-ray emission of wind-driven ISM bubbles around these young associations. Striking correlations appear amongst the x-ray, radio and optical morphologies of the 30 Doradus Nebula, with x-ray emitting bubbles filling cavities surrounded by H alpha shells; coextensive diffuse x-ray and radio continuum emission is present throughout this star formation complex. A bright extended x-ray emission region, enclosed by the shell-like structure LMC 2 of the cold and warm interstellar medium, can be well described as a supergiant bubble breaking out of the dense galactic plane. We discuss the origin of these star formation regions as well as the prospects for using the LMC as a testbed for global ISM models. Dissert. Abstr.

N92-27687# Toronto Univ. (Ontario). Dept. of Astronomy.
GRAVITATIONAL CLUSTERING OF GALAXIES: DISTRIBUTION OF GALAXY COUNTS IN CELLS Ph.D. Thesis
Yin Zhan 4 Sep. 1990 144 p
(ISBN-0-315-59910-3; CTN-92-60480) Copyright Avail:

Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The probability distribution of galaxy counts in cells has been emphasized recently as an important statistical measure of galaxy clustering since it contains information on correlation functions of all orders. A simple analytic formula for this distribution has been proposed by Saslaw and Hamilton from the view point of gravitational thermodynamics considered for a statistically homogeneous and isotropic gravitating system (the universe) of identical particles (galaxies). It appears that gravitational thermodynamic theory may not account for the accuracy of Saslaw and Hamilton's formula, as found numerically by N-body simulations. The intriguing problem of why the formula is so accurate is at least partially resolved by showing that the formula is consistent with all the relevant predictions of gravitational clustering theory. Comparison of the formula with the observations suggests that galaxy clustering is mainly an inevitable consequence of gravitational instability occurring in a statistically homogeneous and isotropic gravitating system started with a zero or small peculiar velocity field and a random or nearly random spatial distribution of galaxies. Saslaw and Hamilton's formula has also been reported to be sufficient for describing counts of galaxy clusters in cells. This is consistent with the usual hierarchical clustering scenario in which galaxy clusters formed from galaxies as bound dynamical entities and started to cluster under their mutual gravitational attractions with essentially the same initial conditions as galaxies. It is shown that the observed mass function of galaxy clusters is also consistent with such a clustering scenario. Author (CISTI)

N92-27689# Queens Univ., Kingston (Ontario). Dept. of Physics.

DEVELOPMENT OF VOIDS IN THE THIN-WALL APPROXIMATION Ph.D. Thesis

Rick Pim 23 Dec. 1989 116 p

(ISBN-0-315-60772-6; CTN-92-60483) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The evolution of spherical voids in a Robertson-Walker background is studied within the context of the general relativistic thin-wall approximation. The background is taken to be a noninteracting mixture of dust and blackbody radiation. An extension of earlier work by Maeda and Sato with the refinements of background pressure, surface pressure, and interior mass is presented, with the void interior taken to be a vacuum. These refinements have important effects on the evolution of voids. The vacuum interior is replaced with an interior of Robertson-Walker radiation. The inclusion of radiation within the void has significant quantitative and important qualitative effects on void evolution. In general terms, the interior radiation pressure causes the voids to grow much more readily than vacuum voids. In particular, in a flat background, voids that do not collapse grow, at late times, like the particle horizon. Voids in an open background, on the other hand, tend to become comoving at late times. The formalism is applied to a replacement of the Robertson-Walker metric of the background with the de Sitter metric, retaining the Robertson-Walker interior. This permits examination of the simple inflationary scenario of a bubble of true vacuum expanding into a false vacuum background. It was found that, while the bubble grows, the growth is not as strong as might have been expected. Author (CISTI)

N92-27690# Toronto Univ. (Ontario).

FLUCTUATIONS FOR GALAXY FORMATION FROM INFLATION MODELS Ph.D. Thesis

David Salopek 29 Sep. 1989 264 p

(ISBN-0-315-54662-X; CTN-92-60486) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The theory of fluctuations for galaxy formation from chaotic inflation models is extended to include the effects of: (1) multiple scalar fields; (2) curvature coupling of scalar fields to gravity; (3) nonlinear evolution of long wavelength metric and scalar fields; and (4) stochastic generation of initial conditions. The chaotic inflation scenario may be housed within a grand unified theory (GUT) framework through a coupling of scalar Higgs field to curvature. If the curvature coupling is chosen large and negative, then a more natural value of scalar field self-coupling lambda approximately equals 0.05 gives the observed level of fluctuations. Using Hamilton-Jacobi theory, a general formalism is presented for following the nonlinear evolution of the metric (scalar, vector, and tensor modes) and scalar fields for fluctuations with wavelengths greater than the Hubble radius. Employing an expansion accurate to first order in spatial gradients, the classical momentum constraint of the Arnowitt-Deser-Misner (ADM) formalism may be integrated exactly without recourse to linear perturbation theory. It is shown how nonlinear effects of the metric and scalar fields may be included in Starobinski's formulation of stochastic inflation. A Fokker-Planck equation is formulated which describes how the probability function evolves in time. Analytic Green's function solutions are obtained for a single scalar field self interacting through an exponential potential. Author (CISTI)

N92-27699# Queens Univ., Kingston (Ontario). Dept. of Physics.

TURBULENT COOLING FLOWS IN GALAXIES AND CLUSTERS Ph.D. Thesis

Catherine Westbury 16 Nov. 1990 226 p

(ISBN-0-315-61634-2; CTN-92-60481) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

The first turbulent models of cooling flows in both elliptical galaxies and clusters of galaxies are presented. The effects of turbulence are modelled by parameters describing the turbulent viscosity and the turbulent heat conduction. The star-forming cooling condensates are removed via a prescription involving characteristic turbulent time scales. Comparisons of turbulent and laminar models highlight the turbulent effects. In particular, turbulent models have higher velocities and smaller temperature gradients over the flow than do laminar models. These result in distinct observational signatures which can be used to determine the role played by turbulence in cooling flows. Aside from the turbulent parameters, the gravitational potential is the most important factor in the models. Models of particular galaxies and clusters indicate that, because of the shallow gravitational potential in clusters, turbulence dominates in cluster cooling flows, while having a much smaller effect on flows with steeper and deeper potentials such as seen in isolated elliptical galaxies. The predictions derived from these calculations are timely in view of the data soon expected from the new generation of X-ray telescopes. Author (CISTI)

N92-27701# Queens Univ., Kingston (Ontario). Dept. of Physics.

SELF-SIMILAR SPIRAL STRUCTURE IN ASTROPHYSICAL DISKS Ph.D. Thesis

Chris Loken 9 Nov. 1990 158 p

(ISBN-0-315-61539-7; CTN-92-60485) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

A self-similar formalism is presented for studying spiral structure in gas disks. The equations are applicable to molecular clouds and accretion disks and perhaps even galactic disks. In the most general case the two-dimensional formulation is time dependent, the gas is self-gravitating and non-ideal physical processes such as viscosity, heat conduction and radiative losses are incorporated. When the gas is taken to be ideal, it is shown that the effects of a passive halo may be included; further restricting the problem to be time independent allows inclusion of a central point-mass as well. For a steady-state, ideal gas analytic and uniform flow solutions are found for zero temperature disks controlled by a central mass and by a passive halo. Accretion solutions containing spiral-shaped shocks are found numerically for the case of a

steady-state, ideal gas disk in a central potential. For these solutions, it is shown that increasing the adiabatic index results in more and weaker shocks. For the full time-dependent, viscous gas case periodic outflow solutions are found for which the derivative of the temperature is discontinuous at a spiral arm. The solutions with small pitch angles have pattern speeds greater than the gas speed and display relatively small, smooth variations. In the case of larger pitch angles, the gas flows more rapidly than the pattern and solutions reminiscent of shocks are found. It is argued that star formation near the density peak in these solutions will provide a heat source which can be made consistent with the jump in the temperature derivative. Author (CISTI)

N92-28185*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SPAN: ASTRONOMY AND ASTROPHYSICS
Valerie L. Thomas, James L. Green, Wayne H. Warren, Jr., and Brian Lopez-Swafford (Science Applications Research, Lanham, MD.) Jan. 1987 12 p
(NASA-TM-107940; NAS 1.15:107940;
NSSDC/WDC-A-R/S-87-06) Avail: NTIS HC/MF A03
The Space Physics Analysis Network (SPAN) is a multi-mission, correlative data comparison network which links science research and data analysis computers in the U.S., Canada, and Europe. The purpose of this document is to provide Astronomy and Astrophysics scientists, currently reachable on SPAN, with basic information and contacts for access to correlative data bases, star catalogs, and other astrophysic facilities accessible over SPAN. H.A.

N92-27243*# Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France).
MICROMETEOROIDS AND DEBRIS ON LDEF Abstract Only
Jean-Claude Mandeville *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 32 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27244*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DETAILED EXAMINATION OF LDEF'S FRAME AND THE A0178 THERMAL BLANKETS BY THE METEOROID AND DEBRIS SPECIAL INVESTIGATIONS GROUP Abstract Only
Thomas H. See, Jack L. Warren, Kimberly S. Mack (Lockheed Engineering and Sciences Co., Houston, TX.), and Michael E. Zolensky *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 33 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27245*# Aerospace Corp., El Segundo, CA.
LDEF EXPERIMENT M0003 METEOROID AND DEBRIS SURVEY Abstract Only
M. J. Meshishnek, S. R. Gyetvay, K. W. Paschen, and J. M. Coggi *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 34 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27246*# POD Associates, Inc., Albuquerque, NM.
DAMAGE AREAS DUE TO IMPACT CRATERS ON LDEF ALUMINUM PANELS Abstract Only
Cassandra R. Coombs, Dale R. Atkinson, Martha Allbrooks, and J. D. Wagner *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 35 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27249*# Kent Univ., Canterbury (England). Unit for Space Sciences.
LDEF'S MAP EXPERIMENT FOIL PERFORATIONS YIELD HYPERVELOCITY IMPACT PENETRATION PARAMETERS Abstract Only
J. A. M. McDonnell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 38 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27250*# Auburn Univ., AL. Space Power Inst.
HYPERVELOCITY IMPACT FACILITY FOR SIMULATING MATERIALS EXPOSURE TO IMPACT BY SPACE DEBRIS Abstract Only
M. Frank Rose, S. G. Best, T. Chaloupka, and B. Stephens *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 39 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27251*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
METEOROID AND DEBRIS SPECIAL INVESTIGATION GROUP; STATUS OF 3-D CRATER ANALYSIS FROM BINOCULAR IMAGERY Abstract Only
Clyde A. Sapp, Thomas H. See (Lockheed Engineering and Sciences Co., Houston, TX.), and Michael E. Zolensky *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 40 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27252*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CHARACTERISTICS OF HYPERVELOCITY IMPACT CRATERS ON LDEF EXPERIMENT S1003 AND IMPLICATIONS OF SMALL PARTICLE IMPACTS ON REFLECTIVE SURFACES Abstract Only
Michael J. Mirtich and James E. Merrow (Cleveland State Univ., OH.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 41 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27253*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LONG DURATION EXPOSURE FACILITY (LDEF) ATTITUDE MEASUREMENTS OF THE INTERPLANETARY DUST EXPERIMENT Abstract Only
Philip C. Kassel, Jr., S. Fred Singer, J. Derral Mulholland, John P. Oliver, Jerry L. Weinberg, William J. Cooke, Jim J. Wortman (North Carolina State Univ., Raleigh.), and William R. Motley, III *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 42 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27254*# Observatoire de la Cote d'Azur, Nice (France).
LONG-TERM PARTICLE FLUX VARIABILITY INDICATED BY COMPARISON OF INTERPLANETARY DUST EXPERIMENT (IDE) TIMED IMPACTS FOR LDEF'S FIRST YEAR IN ORBIT WITH IMPACT DATA FOR THE ENTIRE 5.75-YEAR ORBITAL LIFETIME Abstract Only
J. Derral Mulholland, Charles G. Simon, William J. Cooke, John P. Oliver, and V. Misra (North Carolina State Univ., Raleigh.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 43 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27255*# Institute for Space Science and Technology, Inc., Gainesville, FL.
ELEMENTAL ANALYSES OF HYPERVELOCITY MICRO-PARTICLE IMPACT SITES ON INTERPLANETARY DUST EXPERIMENT SENSOR SURFACES Abstract Only
Charles G. Simon, J. L. Hunter, D. P. Griffis, V. Misra, D. R. Ricks, and Jim J. Wortman (North Carolina State Univ., Raleigh.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 44 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27256*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SCANNING ELECTRON MICROSCOPE/ENERGY DISPERSIVE X RAY ANALYSIS OF IMPACT RESIDUES ON LDEF TRAY CLAMPS Abstract Only
Ronald P. Bernhard, Christian Durin (Centre National d'Etudes Spatiales, Toulouse, France), and Michael E. Zolensky *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 45 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27257*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
COMPOSITIONAL ANALYSIS OF PROJECTILE RESIDUES ON LDEF INSTRUMENT AO187-1 Abstract Only
Ronald P. Bernhard (Lockheed Engineering and Sciences Co., Houston, TX.) and F. Horz *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 46 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27258*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INTERPLANETARY METEOROID DEBRIS IN LDEF METAL CRATERS Abstract Only
D. E. Brownlee, F. Horz, and J. Bradley (McCrone Associates, Inc., Westmont, IL.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 47 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27259*# Washington Univ., Saint Louis, MO. Center for Space Sciences.
SIMS CHEMICAL ANALYSIS OF EXTENDED IMPACTS ON THE LEADING AND TRAILING EDGES OF LDEF EXPERIMENT AO187-2 Abstract Only
S. Amari, J. Foote, Charles G. Simon, P. Swan, R. M. Walker, E. Zinner, E. K. Jessberger, G. Lange, and F. Stadermann (Max-Planck-Inst. fuer Kernphysik, Heidelberg, Germany, F.R.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 48 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27260*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
FURTHER ANALYSIS OF LDEF FRECOPA MICROMETEROID REMNANTS Abstract Only
J. Borg, T. E. Bunch, and Filippo RadicatidiBrozolo (Evans, Charles and Associates, Redwood City, CA) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 49 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27261*# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).
PREDICTED AND OBSERVED DIRECTIONAL DEPENDENCE OF METEOROID/DEBRIS IMPACTS ON LDEF THERMAL BLANKETS Abstract Only
Gerhard Drolshagen *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 50 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27263*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ASTEROIDAL VERSUS COMETARY METEOROID IMPACTS ON THE LONG DURATION EXPOSURE FACILITY (LDEF) Abstract Only
Herbert A. Zook *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 52 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27264*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ORIGIN OF ORBITAL DEBRIS IMPACTS ON LONG DURATION EXPOSURE FACILITY'S (LDEF) TRAILING SURFACES Abstract Only
Donald J. Kessler *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 53 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27267*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEW METEOROID MODEL PREDICTIONS FOR DIRECTIONAL IMPACTS ON LDEF Abstract Only
Neil Divine and Rene C. Aguero *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 56 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.
For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance.*

N92-27637 Iowa Univ., Iowa City.
ELECTROMAGNETIC EFFECTS IN SATURN'S B RING Ph.D. Thesis
Lin-Hua Shan 1990 104 p
Avail: Univ. Microfilms Order No. DA9126344

Voyager observations have revealed that the Saturnian B ring is much more structured than previously anticipated. Some of these structures occur on radial scale lengths of less than 3 km. In the visible, the ring has an optical depth minimum at a distance about 2,000 km outside of synchronous orbit (r(sub s) = 1.866 R(sub), where R(sub s) equals 60,330 km is the radius of Saturn). Voyager also observed transient radial aligned features in the central dense B ring: the spokes. It is believed that these spokes are composed of fine negatively charged dust grains levitated above the ring surface by electrostatic forces. In order to quantify the spokes model proposed by Goertz and Morfill (1983), a Monte Carlo simulation of the levitation and charging of fine dust grains is developed. Only dust particles which escape the ring Debye sheath contribute to the spokes. A size distribution for spokes particles is obtained with a most probable size of about 0.15 microns and a spread of +0.5 microns and -0.1 microns. Dust particles of smaller size do not escape the Debye sheath because of their small cross section for charging while bigger dust particles are limited by their large intertia. This result is in good agreement with other estimates. Once the spoke particles are levitated they 'hop' in the radial direction. A radial transport of angular momentum is associated with this radial transport of charged submicron-size spokes particles. This mechanism induces an instability which produces, over geological times, significant radial structuring of the ring. Mass is transported away from the synchronous orbit. This produces the optical depth minimum there. Simulations of this mechanism are carried out. They yield a radial optical depth profile which is similar to what is observed. It is found that it takes about 150 million years to produce the observed structure. This estimate for the age of the B ring agrees with some other independent estimates. Dissert. Abstr.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

For related information see *93 Space Radiation.*

N92-27415# Pennsylvania Univ., Philadelphia. Dept. of Physics.
SUDBURY NEUTRINO OBSERVATORY
E. W. Beier Mar. 1992 11 p
(Contract DE-FG02-88ER-40479)
(DE92-011021; DOE/ER-40479/T1) Avail: NTIS HC/MF A03

This document is a technical progress report on work performed at the University of Pennsylvania during the current year on the Sudbury Neutrino Observatory project. The motivation for the experiment is the measurement of neutrinos emitted by the sun. The Sudbury Neutrino Observatory (SNO) is a second generation dedicated solar neutrino experiment which will extend the results of our work with the Kamiokande II detector by measuring three reactions of neutrinos rather than the single reaction measured by the Kamiokande experiment. The collaborative project includes physicists from Canada, the United Kingdom, and the United States. Full funding for the construction of this facility was obtained in Jan. 1990, and its construction is estimated to take five years. The motivation for the SNO experiment is to study the fundamental properties of neutrinos, in particular the mass and mixing parameters, which remain undetermined after decades of experiments in neutrino physics utilizing accelerators and reactors as sources of neutrinos. To continue the study of neutrino properties it is necessary to use the sun as a neutrino source. The long distance to the sun makes the search for neutrino mass sensitive to much smaller mass than can be studied with terrestrial sources. Furthermore, the matter density in the sun is sufficiently large to enhance the effects of small mixing between electron neutrinos and mu or tau neutrinos. This experiment, when combined with the results of the radiochemical Cl-37 and Ga-71 experiments and the Kamiokande II experiment, should extend our knowledge of these fundamental particles, and as a byproduct, improve our understanding of energy generation in the sun. DOE

N92-27818# Defence Research Establishment, Ottawa (Ontario).
MODELLING SOLAR RADIATION IN THE ARCTIC: AN IMPROVED METHOD FOR THE SUBDIVISION OF GLOBAL RADIATION
C. L. Gardner and C. A. Nadeau Nov. 1991 20 p
(AD-A246271; DREO-TN-91-26) Avail: NTIS HC/MF A03

From an analysis of solar radiation collected at Alert, N.W.T., it was shown previously that existing solar energy models overestimate slope irradiance at low solar angles. In this technical note it is shown that this overestimation results from the breakdown of the relationship between sky condition and atmospheric transmissivity. In particular, at low solar elevations, the portion of the global radiation being attributed to direct radiation at low solar elevations has been developed. GRA

N92-27841# New Jersey Inst. of Tech., Newark. Dept. of Physics.
SOLAR ACTIVITY CYCLE Final Report, 1 Nov. 1988 - 31 Oct. 1991
Philip Goode 31 Oct. 1991 3 p
(Grant AF-AFOSR-0048-89)
(AD-A247212; AFOSR-92-0078TR) Avail: NTIS HC/MF A01

Work focused on describing the solar activity cycle's clock as a torsional oscillator, and describing the origin of the 5 minute oscillations, which are used as a seismic probe. It has been discovered that the sun's rotation does not vary near the base of the convection zone but may vary deeper down. The full equations for the torsional oscillator have been developed and have been solved for certain situations. It has been shown that the 5 minute oscillations are driven by granular size explosive events. In observational work, the observing set-up has been designed to capture the whole solar disk. Data is now able to be collected in a production mode. Data reduction programs also are in full operation. The basic behavior of 5 minute oscillations has been clearly seen. A search is underway for the global organization of convection to determine if giant cells exist. GRA

N92-27935# Tufts Univ., Medford, MA. Dept. of Physics and Astronomy.
VLA, PHOENIX AND BATSE OBSERVATIONS OF AN X1 FLARE
Robert F. Willson, Marcus J. Aschwanden, and Arnold O. Benz 22 Jan. 1992 9 p
(Grant AF-AFOSR-0147-89)
(AD-A248461; AFOSR-92-0193TR) Avail: NTIS HC/MF A02

We present observations of an X1 flare detected simultaneously with the Very Large Array (VLA), the PHOENIX Digital Radio Spectrometer, and the Burst and Transient Source Experiment (BATSE) aboard the Gamma Ray Observatory (GRO). The VLA was used to produce snapshot maps of the impulsive burst emission in the higher corona on timescales of 1.7 seconds at both 20 and 01 cm. Our results indicate electron acceleration several minutes before the onset of the hard X-ray burst detected by BATSE. Comparisons with high spectral and spatial observations by PHOENIX reveal a variety of radio bursts at 20 cm, such as type III bursts, intermediate drift bursts, and quasi-periodic pulsations during different stages of the X1 flare. From the drift rates of these radio bursts we derive information on local density scale heights, the speed of radio exciters, and the local magnetic field. Radio emission at 90 cm shows a type IV burst moving outward with a constant velocity of 240 km/sec. The described X1 flare is unique in the sense that it appeared at the east limb (N06/E88 providing the most accurate information on the vertical structure of different flare tracers visible in radio wavelengths. GRA

N92-28059# Stanford Univ., CA. Center for Space Science and Astrophysics.
IDENTIFICATION OF DRIVER GAS-ASSOCIATED Bz EVENTS AND PREDICTION OF THEIR ORIENTATION
Xuepu Zhao and J. T. Hoeksema 1992 6 p
(AD-A248480) Avail: NTIS HC/MF A02

An approach for identifying a driver gas-associated Bz event and its solar source is introduced. Seven newly identified events are used to further test the model developed by Hoeksema and Zhao 1991 for prediction of the magnetic orientation of some driver gas-associated Bz events from photospheric field observations. Comparison of the model predictions with observations confirms that the model may be appropriate only for those driver gas-associated Bz events which have magnetic structures lacking large internal field rotation and are associated with active region-CMEs. GRA

N92-28221*# Computer Sciences Corp., Lanham, MD.
FUTURE MISSIONS STUDIES: COMBINING SCHATTEN'S SOLAR ACTIVITY PREDICTION MODEL WITH A CHAOTIC PREDICTION MODEL
S. Ashrafi Nov. 1991 29 p
(Contract NAS5-31500)
(NASA-CR-189865; NAS 1.26:189865; Rept-554-FDD-91/125; SEAS-(550)/IM-91/047-(52-404)) Avail: NTIS HC/MF A03

K. Schatten (1991) recently developed a method for combining his prediction model with our chaotic model. The philosophy behind this combined model and his method of combination is explained. Because the Schatten solar prediction model (KS) uses a dynamo to mimic solar dynamics, accurate prediction is limited to long-term solar behavior (10 to 20 years). The Chaotic prediction model (SA) uses the recently developed techniques of nonlinear dynamics to predict solar activity. It can be used to predict activity only up to the horizon. In theory, the chaotic prediction should be several orders of magnitude better than statistical predictions up to that horizon; beyond the horizon, chaotic predictions would theoretically be just as good as statistical predictions. Therefore, chaos theory puts a fundamental limit on predictability. Author

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N92-27390# Argonne National Lab., IL.
COMBINATION OF PROBABILITIES IN LOOKING FOR COSMIC RAY SOURCES
M. Goodman Aug. 1991 5 p Presented at the International Cosmic Ray Conference, Dublin, Ireland, 11-23 Aug. 1991
(Contract W-31-109-eng-38)
(DE92-010350; ANL/HEP/CP-91-113; CONF-9108141-3) Avail: NTIS HC/MF A01

The use of small chance probabilities as evidence for sources of cosmic rays is examined, with particular emphasis upon issues involved when combining results from two experiments, two analyses, or two independent tests of the same data. Examples are given in which different methods of combining results should be used. DOE

N92-27405# Bonn Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftlichen Fakultaet.
EXAMINATION OF SELECTED JETS OF EXTRAGALACTIC RADIO SOURCES Ph.D. Thesis [UNTERSUCHUNG AUSGEWAEHLTER JETS EXTRAGALAKTISCHER RADIOQUELLEN]
Christian A. Hummel May 1990 148 p In GERMAN
(ETN-92-90827) Avail: NTIS HC/MF A07

It is shown that an expansion of the quasar jet is measurable. The properties of radio emission of the jet were examined on the principle of the theory of homogeneous and inhomogeneous synchrotron components. A model was developed for studying the lateral oscillations of the jet. The discovery of a regular formed sinus wave is emphasized. Maps of very high resolution allowed the detailed study of jet kinematics. ESA

N92-27493# Academy of Sciences of the Armenian SSR, Erivan.
ANALYSIS OF THE POSSIBILITIES OF SUPPRESSION OF THE COSMIC-RAY BACKGROUND WHEN DETECTING VERY HIGH ENERGY COSMIC GAMMA QUANTA BY MEANS OF A SYSTEM OF CHERENKOV GAMMA TELESCOPES WITH MULTICHANNEL LIGHT RECEIVERS
F. A. Agaronyan, A. K. Konopelko, A. V. Plyasheshnikov, and A. A. Chilingaryan 1990 29 p In RUSSIAN
(DE92-620916; EFI-1274-60-90) Avail: NTIS HC/MF A03

A multi-dimensional correlation analysis based on the Bayesian decision rules and non-parametric estimation of multi-dimensional probability densities is used to classify the Cherenkov images registered by a system of Cherenkov gamma telescopes with multichannel light receivers. The difference in the size of the Cherenkov image and its location and orientation in the focal plane of the gamma telescope mirror are used to classify the events initiated by the cosmic gamma quanta from discrete sources and by cosmic rays. The multi-dimensional correlation analysis is shown to allow to discriminate the cosmic ray background down to fractions of a percent, thus leaving about 50 percent of the events useful. DOE

N92-27494# Academy of Sciences of the Armenian SSR, Erivan.
STUDY OF THE CHARGE AND ENERGY DISTRIBUTIONS OF LOW-ENERGY PARTICLES OF COSMIC RADIATION IN THE NEAR-EARTH ORBIT BY THE METHOD OF CONTROLLABLE NUCLEAR EMULSION
A. B. Akopova, V. E. Dudkin, N. V. Magradze, A. A. Moiseenko, and Yu. V. Potapov 1990 13 p In RUSSIAN
(DE92-620924; EFI-1286-72-90) Avail: NTIS HC/MF A03

A method of controlling the threshold sensitivity of stripped nuclear emulsions is developed. The method is based on a dosed weakening of the development of the latent image by imbedding Br(-) ions from emitters exposed to ultraviolet light and then glued on both sides of the working layer. The integral charge spectrum of the charged particles registered outside the surface of KOSMOS-1571 satellite is determined by the method of controllable nuclear emulsions behind a shielding of about 1 g/sq cm. The protons, helium, and carbon nuclei are also identified. This allows one to determine the differential energy spectra of the particles, and on this basis to calculate the absorption doses equal to 0.85, 0.10, and 0.025 mrad/day for proton, helium, and carbon respectively. DOE

N92-27495# Academy of Pedagogical Sciences of the USSR, Moscow. Nauchno-Issledovatelskij Inst. Mekhaniki.
TO THE PRIMARY RESULTS OF EXPERIMENTS IN COSMIC RADIATION PARTICLE INVESTIGATION IN THE ENERGY RANGE E(GREATER THAN EQUALS)2 TeV AT THE KOSMOS-1713 SATELLITE WITH THE SOKOL-2 EQUIPMENT
I. P. Ivanenko, I. D. Rapoport, and V. Ya. Shestoperov 1990 11 p In RUSSIAN
(DE92-620935; NIIYaF-MGU-90-36-182) Avail: NTIS HC/MF A03

The supplementary information is given. The information covers earlier published primary data of the experiments on high-energy cosmic radiation investigation at the KOSMOS-1713 satellite with the SOKOL-2 equipment. DOE

N92-27635 Columbia Univ., New York, NY.
AUTOGRAVITY WAVES IN A POLYTROPIC LAYER Ph.D. Thesis
Zhongshan Qian 1991 63 p
Avail: Univ. Microfilms Order No. DA9127955

The mystery of the spiral arms in galaxies is investigated. Since B. Lindblad, a few theories have come up that partially explain the spiral arms. One theory is due to C. C. Lin and F. H. Shu. They interpret the spiral arms as a density wave. This theory has been partially supported by observations. However it has also generated some criticism. A major weakness of this theory is its dispersiveness. That is, after a long enough time, there will be no localized structure in the system, which is contrary to the observations. The remedy for this defect is to include the nonlinear term that balances the dispersive term. With this in mind, we explore the nonlinear properties of a simple model of galactic slab. The model was originally studied by Ledoux in 1952. We consider here a polytropic gas slab under the influence of both self-gravitational and external potential. Physically, the external force can be thought of as a compound effect of the halo surrounding the whole galaxy. We then study the development of gravitational instability. To get to the nonlinear regime, we choose mild instability; that is to say the control parameters are near the critical point. In the long wavelength limit, we found that the waves obey the nonlinear evolution equations similar to the Bousinesq and K.d.V. equations if we choose the appropriate scalings. On the other hand, if we choose the scalings similar to the shallow water theory, the equations will be modified shallow water equations in a projected dimension. The possibility of some nonlinear solutions is also discussed. We discover the solitary and periodic solutions in a general form. Dissert. Abstr.

N92-27685# Toronto Univ. (Ontario). Dept. of Astronomy.
OBSERVATIONAL ANALYSIS OF THE MAGNETO-IONIC PLASMA WITHIN AND AROUND EXTRAGALACTIC RADIO SOURCES Ph.D. Thesis
Edwin Leopold Herman Zukowski 6 Apr. 1990 305 p
(ISBN-0-315-56913-1; CTN-92-60478) Copyright Avail: Micromedia Ltd., Technical Information Centre, 165 Hotel de Ville, Place du Portage, Phase 2, Hull, Quebec J8X 3X2, Canada HC $45.00 CAN, MF $15.00 CAN

Polarimetric radio observations were obtained, with both single-dish (MPIfR 100-m) and synthesis array (NRAO-VLA) telescopes. The MPIfR 100-m telescope was used to observe approximately 150 radio galaxies at 6.3 cm. The two main results of the integrated polarization analysis are: (1) for radio galaxies of low redshift, the high-powered sources tend to possess a lower

degree of polarization than the low-powered sources; and (2) for radio galaxies at high redshifts, the degree of polarization is larger than that observed in low redshift sources of the same luminosity. Possible interpretations of these trends are presented. The NRAO-VLA was used to map 3C46, 3C55, 3C153, 3C219, 3C227, 3C234, 3C270, 3C272.1, 3C275.1, 3C324, and 3C402 at several L-band frequencies in order to generate high-resolution radio magnetic (RM) images. Additional data at C-band is presented for 3C46, 3C219, 3C234, and 3C272.1. The RM dispersions were small except in the case of 3C153 and 3C324. Both 3C270 and 3C272.1 show RM bands whose orientation correlates with the shape of the optical galaxy. A least-squares fit of model RM images to the observed RM images yielded magneto-ionic densities of ca 0.003 and approximately 0.009 microGauss per cu cm for the northern component of 3C402 and the eastern head of 3C234, respectively. Analysis of the 11 sources revealed that random orientations in the magnetic field structure were the dominant component of the Faraday rotation. Large-scale depolarization is attributed to either external rotation by a clumpy thermal plasma surrounding the source, or internal rotation with very small pathlengths. Author (CISTI)

N92-27876*# California Inst. of Tech., Pasadena. Lab. of Physics.
NEW ASPECTS OF HEAVY COSMIC RAYS FROM CALCIUM TO NICKEL (Z = 20 TO 28) Final Technical Report, 1 Jan. 1988 - 31 Jul. 1990
Richard A. Mewaldt and W. R. Webber (New Mexico State Univ., University Park.) 31 Jul. 1990 17 p
(Grant NAG8-678)
(NASA-CR-190404; NAS 1.26:190404) Avail: NTIS HC/MF A03

Over the two year course of this grant a study was conducted to explore the implications of composition measurements of heavy cosmic rays made by the Third High Energy Astronomy Observatory (HEAO-3). To interpret these and other measurements this study combined for the first time new laboratory measurements of the fragmentation cross sections of heavy nuclei, a new semi-empirical cross section formula, and the latest in cosmic ray propagation and solar modulation models. These models were used to interpret abundance measurements from six recent satellite experiments, including, in particular, two from HEAO-3. The principal results of the study were: (1) an improved interpretation of the Mn-54 clock in cosmic rays, including predictions of the isotopic abundances of Mn for comparison with future isotope measurements; (2) the first realization of the effect of Mn-54 decay on studies of the source abundances of Fe isotopes; (3) improved source abundances of the elements Ar, Ca, Cr, Mn, Fe, and Ni in the cosmic ray source material; (4) an improved fit to the abundances of Fe secondaries in cosmic rays; and (5) additional evidence that supports the validity of the leaky-box model of cosmic ray propagation in the galaxy. This final report summarizes these new results, the new tools that were developed to obtain them, and presents a bibliography of talks and publications that resulted from this work. Author

N92-28147# Rensselaer Polytechnic Inst., Troy, NY. Dept. of Physics.
PROBING COSMIC INFRARED SOURCES: A COMPUTER MODELING APPROACH Annual Report, 1 Nov. 1990 - 31 Oct. 1991
Chun M. Leung 31 Oct. 1991 5 p
(Grant AF-AFOSR-0104-89)
(AD-A247038; AFOSR-92-0106TR) Avail: NTIS HC/MF A01

The research in infrared astronomy has modeled several classes of infrared sources and modified and generalized existing computer codes. The effects of temperature fluctuations due to small grains on the energy spectrum and infrared surface brightness of interstellar clouds heated externally by the interstellar radiation field were studied. A detailed study has begun on the grain formation problem in stellar outflows. The effects of fractal dust grains on the spectrum of infrared sources has been studied. Models are being developed of the physical conditions in the circumstellar envelopes of evolved stars. The chemistry of two dense interstellar clouds is being studied. The effect of temperature dependent opacity on the emergent spectra of infrared sources is being investigated. GRA

N92-27223*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
STATUS OF LDEF IONIZING RADIATION MEASUREMENTS AND ANALYSIS Abstract Only
T. A. Parnell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 9 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27224*# Pacific Northwest Lab., Richland, WA.
SENSITIVITY OF LDEF FOIL ANALYSES USING ULTRA-LOW BACKGROUND GERMANIUM VERSUS LARGE NaI(T1) MULTIDIMENSIONAL SPECTROMETERS Abstract Only
James H. Reeves, Richard J. Arthur, and Ronald L. Brodzinski *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 10 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

N92-27241*# Dublin Inst. for Advanced Studies (Ireland).
ULTRA HEAVY COSMIC RAY EXPERIMENT (A0178) Progress Report Abstract Only
A. Thompson, D. OSullivan, J. Bosch, R. Keegan, K. P. Wenzel, F. Jansen, and C. Domingo (Universidad Autonoma de Barcelona, Bellaterra, Spain) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 27 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

99 GENERAL

N92-27218*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SECOND LDEF POST-RETRIEVAL SYMPOSIUM ABSTRACTS Abstracts Only
Arlene S. Levine, comp. Jun. 1992 133 p Symposium held in San Diego, CA, 1-5 Jun. 1992; sponsored by NASA, Washington and AIAA
(RTOP 196-88-00-03)
(NASA-CP-10097; NAS 1.55:10097) Avail: NTIS HC/MF A07

These abstracts from the symposium represent the data analysis of the 57 experiments flown on the LDEF. The experiments include materials, coatings, thermal systems, power and propulsion, science, (cosmic ray, interstellar gas, heavy ions, micrometeoroids, etc.), electronics, optics, and life science. For individual titles, see N92-27219 through N92-27329.

N92-27219*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ATTITUDE STABILITY OF LDEF: REFINEMENT OF RESULTS FROM THE SILVER PINHOLE CAMERA Abstract Only **c18**
P. N. Peters and J. C. Gregory (Alabama Univ., Huntsville.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 3 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

A measurement was previously described of the angular offset and attitude stability of the LDEF spacecraft using a simple pinhole camera device in the UAH experiment A0114. This device uses a silver surface to record the impact zone of atmospheric atomic oxygen passing through a small pinhole on the front surface of the satellite. The shape and size of this zone are well defined if the satellite velocity and gas temperature are known. The circular symmetry of the zone would be distorted by oscillation of the LDEF about its stable attitude, or by the effect of the co-rotation of the Earth's atmosphere for cases of satellites in nonequatorial orbits. The observed ellipticity of 1.05 with the major axis in the

yaw direction is equivalent to an oscillation of + or - 0.2 deg about the stable attitude. The uncertainty in that measurement was estimated at about 0.1 deg. A refined analysis based on summing distributions of flux versus incidence angle for a large number of orbital positions, and including a co-rotating atmosphere, indicates that the combined distributions produce a result consistent with the measured exposed spot. It is suggested that, within the precision of the measurements, no actual oscillation of the LDEF is required to produce the results. Thus, the LDEF may have maintained a stable attitude to better than 0.1 deg, even under conditions of maximum aerodynamic perturbation when the silver oxygen record was made. This error is some two orders of magnitude lower than the predicted uncertainty in yaw oscillation and may indicate that the predict methodologies are too conservative. Author

N92-27220*# Boeing Co., Seattle, WA. Defense and Space Group.
LDEF MICROENVIRONMENTS, OBSERVED AND PREDICTED Abstract Only **c18**
R. J. Bourassa *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 4 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Complex protrusions and surface indentations on spacecraft equipment alter exposure environments by casting shadows, producing reflections and scattering incident atomic oxygen flux and UV radiation. A computer model is being developed to predict these effects. The model accounts for any arbitrary shape, size, orientation, or curvature of exposed objects. LDEF offers a unique opportunity to compare model prediction with observations. For this purpose, a study is underway on twelve of LDEF's copper grounding straps. These straps were exposed at various angles from the ram vector during the LDEF flight. Microenvironment variables include shadowing and reflections from clamps and fasteners, and varying exposure caused by bending of the straps. Strap measurements include optical properties, surface film composition by ESCA, and film thickness measurements by optical interference techniques. The features of the microenvironment model and the analytical methods used to examine the straps are discussed. Data are presented showing predicted microenvironmental variations. These variations are compared with observed point to point differences in surface properties of the straps. Author

N92-27221*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
A GENERALIZED APPROACH TO THE THERMAL ANALYSIS OF THE LONG DURATION EXPOSURE FACILITY'S FLIGHT EXPERIMENTS Abstract Only **c77**
Thomas R. Sampair (Lockheed Engineering and Sciences Co., Hampton, VA.) and William M. Berrios *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 5 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The generalized method used in the thermal analysis of the LDEF flight experiments is presented. The approach consists of developing a mathematical lumped parameter node representation of the experiment; defining the source and sink temperature boundary conditions; calculating the albedo, infrared, and solar orbital heating fluxes; and solving with a finite difference technique. The temperature predictions can be made either on a per orbit basis or for any length of mission time using a daily averaged calculated composite flux. The thermal analysis of the Ultra Heavy Cosmic Ray Experiment (UHCRE-A0178) is presented as an example of this approach. Author

N92-27222*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
ENVIRONET: AN ON-LINE ENVIRONMENT DATA BASE FOR LDEF DATA Abstract Only **c82**
Michael Lauriente *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 6 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

EnviroNET is an on-line, free form data base intended to provide a centralized depository for a wide range of technical information on environmentally induced interactions of use to Space Shuttle customers and spacecraft designers. It provides a user friendly, menu driven format on networks that are connected globally and is available twenty-four hours a day, every day. The information updated regularly, includes expository text, tabular numerical data, charts and graphs, and models. The system pools space data collected over the years by NASA, USAF, other government facilities, industry, universities, and ESA. The models accept parameter input from the user and calculate and display the derived values corresponding to that input. In addition to the archive, interactive graphics programs are also available on space debris, the neutral atmosphere, radiation, magnetic field, and ionosphere. A user friendly informative interface is standard for all the models with a pop-up window, help window with information on inputs, outputs, and caveats. The system will eventually simplify mission analysis with analytical tools and deliver solution for computational intense graphical applications to do 'What if' scenarios. A proposed plan for developing a repository of LDEF information for a user group concludes the presentation. Author

N92-27223*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
STATUS OF LDEF IONIZING RADIATION MEASUREMENTS AND ANALYSIS Abstract Only **c93**
T. A. Parnell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 9 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The LDEF-1 results from the particle astrophysics, radiation environments, and dosimetry measurements on LDEF-1 are summarized, including highlights from presentations at the 2nd symposium. Progress in using LDEF data to improve radiation environment models and calculation methods is reviewed. Radiation effects, or the lack thereof are discussed. Future plans of the LDEF Ionizing Radiation Special Investigation Group are presented. Author

N92-27224*# Pacific Northwest Lab., Richland, WA.
SENSITIVITY OF LDEF FOIL ANALYSES USING ULTRA-LOW BACKGROUND GERMANIUM VERSUS LARGE NaI(T1) MULTIDIMENSIONAL SPECTROMETERS Abstract Only **c93**
James H. Reeves, Richard J. Arthur, and Ronald L. Brodzinski *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 10 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Cobalt samples were analyzed for cosmic ray induced Co-60 with both an ultralow background germanium gamma ray spectrometer and with a large NaI(T1) multidimensional spectrometer using electronic anticoincidence shielding. Aluminum samples were analyzed for Na-22. The results are presented along with the relative sensitivities and precision afforded by the two methods. Author

N92-27225*# Los Alamos National Lab., NM. Space Science and Technology Div.
RADIOACTIVITIES INDUCED IN SOME LDEF SAMPLES Abstract Only **c72**
Robert C. Reedy and Calvin E. Moss *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 11 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Final activities are reported for gamma ray emitting isotopes measured in 35 samples from LDEF. In 26 steel trunnion samples, activities of Mn-54 and Co-57 were measured and limits set on other isotopes. In five Al end support retainer plates and two Al keel plate samples, Na-22 was measured. In two Ti clip samples, Na-22 was measured, limits for Sc-46 were obtained, and high

activities for impurity Uranium and daughter isotopes were observed. Four sets of depth vs activity profiles were measured for the D sections of the trunnion. For all 4 profiles, the activities first decreased with increasing distance from the surface of the trunnion but were fairly flat near the center. These profiles are consistent with production by both the lower energy (approx. 100 MeV) trapped particles and high energy (approx. 10 GeV) galactic-cosmic ray particles. For the near surface samples, the earth quadrant had more Mn-54 than the space quadrant. For the D sections, there was less Mn-54 in the east trunnion than in the west trunnion. Comparisons are made among the samples and with activities measured by others. The limit for Sc-46 in the Ti clips is compared with the activities of Mn-54 produced in the steel pieces by similar reactions. Activities predicted by several models are compared with the measured activities. Author

N92-27226*# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering Div.

A PHOTON-PHREAK DIGS THE LDEF HAPPENING Abstract Only **c72**

Alan R. Smith and Donna L. Hurley *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 12 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

Radioactivities of the LDEF onboard experiments induced by gamma emitting rays in both intentional samples and spacecraft parts were examined. The long time greatly enhanced the ability to detect some of the longer lived nuclides, including: 2.6 yr Na-22 in Al and Fe; 5.3 yr Co-60 in Co, Ni, and In; 2.9 yr Rh-102 in In; and 38 yr Bi-207 in Pb. These radionuclides, along with such other as 33 yr Ar-42 in Ti, Fe, or Ni and 47 yr Ti-44 in the same elements, would be appropriate monitors of the high energy space radiation field on long round-trip voyages in the solar system. Additional candidate radionuclides are also discussed. Radiometric analysis of the LDEF samples was a substantial effort among a dedicated group of experts in low level counting, and highlights several important aspects of the procedures needed to achieve success in this kind of endeavor. Target elements should be chosen to differentiate between neutron and proton induced reactions, whenever this is feasible. Reactions should be chosen with a wide range of energy thresholds, to enable calculation of both intensity and energy spectra of the particle fluxes. Author

N92-27227*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

COLLECTION, ANALYSIS, AND ARCHIVAL OF LDEF ACTIVATION DATA Abstract Only **c82**

C. E. Laird (University of Eastern Kentucky, Richmond.), B. A. Harmon, G. J. Fishman, and T. A. Parnell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 13 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

Samples intentionally placed aboard the LDEF and samples obtained from the LDEF structure were studied at NASA Marshall and seven national labs to determine the radioactivity produced in orbit. The gamma ray spectra from these studies have provided information concerning the type and quantity of radioactive nuclei produced by various activating particles. The gamma ray spectra, the resulting activation, and the experimental arrangements are being collected at Marshall and Eastern Kentucky Univ. for review, further analysis, and future archival. An overview of this process and the type of information that will be available for future reference is given. This information includes the samples studied, the location of the samples on LDEF, the amount and type of covering material, the types of detector systems, the format of the gamma ray spectra, and the corrections for geometry, self-absorption, detector efficiency, and background needed to obtain accurate specific activations (activation per kilogram) of material. Plans are given as to the archival of the data for such future reference and how other scientific investigators or spacecraft designers can access the data. Author

N92-27228*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

INDUCED ACTIVATION STUDY OF LDEF Abstract Only **c72**

B. A. Harmon, G. J. Fishman, T. A. Parnell, and C. E. Laird (University of Eastern Kentucky, Richmond.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 14 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

Analysis of the induced radioactivity of LDEF is continuing with extraction of specific activities for various spacecraft materials. Data and results of activation measurements from eight national facilities are being collected for interpretation. The major activation mechanisms in LDEF components is the proton flux in the South Atlantic Anomaly (SAA) inner radiation belt. This flux is highly anisotropic, and exposes the west side of the spacecraft to higher radiation doses. The directionally dependent activation due to these protons has clearly been observed in the data from Al experiment tray clamps, steel trunnions, and is also indicated by the presence of a variety of radioisotopes in other materials. A secondary production mechanism, thermal neutron capture, was observed in two materials having large capture cross sections, Co and Ta. The neutrons could be thermalized in nearby low Z material, although this has yet to be verified. Specific activities are presented for a number of materials which show SAA effects and thermal neutron capture. Trends are examined in the measured results that show the effect of shielding and non-SAA related activation. Author

N92-27229*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

REVISED PREDICTIONS OF LDEF EXPOSURE TO TRAPPED PROTONS Abstract Only **c72**

J. W. Watts, Jr., T. W. Armstrong, and B. L. Colborn (Science Applications International Corp., Prospect, TN.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 15 (For primary document see N92-27218 18-99)

(Contract NAS8-38566)

Avail: NTIS HC/MF A07

Initial estimates of LDEF exposure to the trapped proton environment were reported previously to aid in the interpretation dosimetry data and in conjunction with dosimetry response predictions. These previous estimates were made using the standard NASA AP8 trapped proton models for two sets of assumed conditions: (1) the omnidirectional flux spectra were calculated with the LDEF altitude and solar activity variations taken into account; and (2) the NASA Marshall anisotropy model was applied to obtain directional spectra, but only for solar minimum conditions and at a single altitude. Herein, the directional trapped proton fluence spectra is calculated considering both the altitude variation and solar activity during the LDEF mission. These additional results represent an extension of previous calculations to provide a more definitive description of the LDEF trapped proton exposure. Author

N92-27230*# Aerospace Corp., Los Angeles, CA. Space and Environment Technology Center.

MEASUREMENTS OF THE RADIATION DOSE TO LDEF BY MEANS OF PASSIVE DOSIMETRY Abstract Only **c72**

J. B. Blake and S. S. Imamoto *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 16 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

A very simple experiment was fielded on LDEF to measure the energetic radiation dose by means of passive dosimetry. It consisted of two identical packets of 16 LiF thermoluminescent dosimeters (TLD) arranged in planar arrays. One array was placed on the leading edge of the spacecraft, the other on the trailing edge. These arrays were installed in opaque packets of 1 mil Al foil and Kapton tape mounted behind an Al plate of 30 mils thickness. The nominal energy thresholds were 14 MeV for protons and 650 keV for electrons. In addition to the flight arrays, two

control arrays were prepared which were kept with the flight arrays as long as possible during experimental integration and then stored in the lab. The flight and control arrays were read out alternating in groups of four; it was found that the control dose was negligible. The flight and control detectors were exposed to a 55 MeV proton beam in order to provide a recalibration of the detectors. It was found that the post-flight and pre-flight calibrations were in good agreement. A comparison of results with the prediction shows that the measured dose was a factor of 4 to 5 low. It is possible that there was in-flight annealing of the TLDs as a result of the long mission and perhaps temperature excursions of the sensors. The East-West effect was larger than expected. The ratio of 1.65 is approximately what was expected for the protons alone. Electrons should reduce the dose ratio since electrons add equally to the leading and trailing edge dose. A possible explanation is that the electron dose was negligible compared to the proton dose. Author

N92-27231*# Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France).
LDEF: DOSIMETRIC MEASUREMENT RESULTS (AO 138-7 EXPERIMENT) Abstract Only **c72**
J. Bourrieau *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 17 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

One of the objectives of the AO 138-7 experiment on board the LDEF was a total dose measurement with Thermo Luminescent Detectors (TLD 100). Two identical cases, both including 5 TLDs inside various aluminum shields, are exposed to the space environment in order to obtain the absorbed dose profile induced. Radiation fluence received during the total mission length was computed, taking into account the trapped particles (solar maximum and solar minimum periods) and the cosmic rays; due to the magnetospheric shielding, the solar proton fluences are negligible on the LDEF orbit. The total dose induced by these radiations inside a semi-infinite plane shield of Al are computed with radiation transport codes. TLD reading are performed after flight; due to the mission duration increase, a post-flight calibration was necessary in order to cover the range of the flight induced dose. The results obtained, similar (+ or - 30 pct.) in both cases, are compared with the dose profile computation. In practice, these LDEF results, with less than a factor 1.4 between measurements and forecasts, reinforce the validity of the computation methods and models used for the long term evaluation of space radiation intensity on low inclination Earth orbits. Author

N92-27232*# Eril Research, Inc., San Rafael, CA.
ABSORBED DOSE MEASUREMENTS AND PREDICTIONS ON LDEF Abstract Only **c72**
A. L. Frank, E. V. Benton, T. W. Armstrong, and B. L. Colborn (Science Applications International Corp., Prospect, TN.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 18 (For primary document see N92-27218 18-99)
(Contract NAS8-38610)
Avail: NTIS HC/MF A07

The overall radiation environment of LDEF was determined in part through the use of thermoluminescent detectors (TLDs). The results given are from four experiments (Biostack, Fiber Optics Data Link, Seeds in Space, and Linear Energy Transfer Spectrum Measurement) and represent a large fraction of existing absorbed dose data. The TLDs (located on leading and trailing edges) were under various shielding depths. The measured absorbed doses were found to reflect both directional dependence of incident trapped protons and shielding. Radiation dosages at both locations and under various shielding depths are given. The effect of the trapped proton anisotropy was such that the western side of LDEF received about 3 times the dose of the eastern side at shielding depths of approx. 1 gm/sq cm. These data are being used to evaluate the accuracy of models currently in use for predicting ionizing radiation environments for low Earth orbit missions. Author

N92-27233*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
CHARGE, ENERGY, AND LET SPECTRA MEASUREMENTS OF CHARGED PARTICLES IN P0006 EXPERIMENT OF LDEF Abstract Only **c72**
E. V. Benton, I. Csige, K. Oda, R. P. Henke, A. L. Frank, E. R. Benton, L. A. Frigo (San Francisco Univ., CA.), T. A. Parnell, J. W. Watts, Jr., and J. H. Derrickson *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 19 (For primary document see N92-27218 18-99)
(Grant NAG8-168)
Avail: NTIS HC/MF A07

Measurements are under way of the charged particle radiation environment of the LDEF satellite using stacks of plastic nuclear track detectors (PNTDs) placed in different locations of the satellite. In the initial work, the charge, energy, and linear energy transfer (LET) spectra of charged particles were measured with CR-39 double layer PNTDs located on the west end of the satellite. Primary and secondary stopping heavy ions as well as relativistic galactic cosmic rays (mostly iron particles) were measured separately. The results will be compared with similar measurements in other locations on LDEF with different orientation and shielding conditions. The remarkably detailed study of the charged particle radiation environment of the LDEF satellite will lead to a better understanding of the radiation environment of the Space Station Freedom. It will enable more accurate prediction of single event upsets (SEUs) in microelectronics and, especially, more accurate assessment of the risk, contributed by the different components of the radiation field to the health and safety of crew members. Author

N92-27234*# Eril Research, Inc., San Rafael, CA.
LIGHT-HEAVY ION MEASUREMENTS IN CR-39 LOCATED ON THE EARTH SIDE OF LDEF Abstract Only **c72**
I. Csige, E. V. Benton, and S. Soundararajan *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 20 (For primary document see N92-27218 18-99)
(Contract NAS8-38610)
Avail: NTIS HC/MF A07

The azimuthal angle distribution and the charge and energy spectra of selected light-heavy (3 less than or = Z less than or = 8) stopping particles were measured in a single layer of CR-39 plastic nuclear track detector (PNTD) from the stack of the A0015 experiment located on the Earth-end of the satellite. The directional incidence of the trapped protons is studied by comparing the azimuthal angle distribution of selected recoils, obtained in the LDEF detectors, to that obtained through calibrations of PNTDs with exposure performed with 200 MeV proton beams from different directions. Similar measurements will be performed in a CR-39 sample exposed on the space-end of the LDEF satellite for intercomparison. The experimental results will also be compared to theoretical calculations. Author

N92-27235*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THREE-DIMENSIONAL SHIELDING EFFECTS ON CHARGED PARTICLE FLUENCES MEASURED IN THE P0006 EXPERIMENT IN LDEF Abstract Only **c72**
I. Csige, E. V. Benton, L. Frigo, T. A. Parnell, J. W. Watts, Jr., T. W. Armstrong, and B. L. Colborn (Science Applications International Corp., Prospect, TN.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 21 (For primary document see N92-27218 18-99)
(Grant NAG8-168)
Avail: NTIS HC/MF A07

The azimuthal and polar angle distribution of the galactic cosmic ray particles (mostly relativistic iron) was measured in the main stack and four side stacks of the P0006 experiment located on the west end of the LDEF satellite. A clear shadowing effect of the radiation shielding of the LDEF satellite is found. The total fluence of stopping protons (mostly primary, trapped particles) was measured as a function of the position in the main and side stacks

of the P0006 experiment. Experimental results are compared with theoretical calculations and the effect of the strong location dependence of particle fluences is explained by the three dimensional shielding model of the P0006 stack. Through comparisons between experimental results and calculations, this work will lead to the refinement of the radiation environment computational models. Author

N92-27236*# Science Applications International Corp., Prospect, TN.
DEVELOPMENT AND APPLICATION OF A 3-D GEOMETRY/MASS MODEL FOR LDEF SATELLITE IONIZING RADIATION ASSESSMENTS Abstract Only **c72**
B. L. Colborn and T. W. Armstrong *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 22 (For primary document see N92-27218 18-99)
(Contract NAS8-38566)
Avail: NTIS HC/MF A07

A computer model of the three dimensional geometry and material distributions for the LDEF spacecraft, experiment trays, and, for selected trays, the components of experiments within a tray was developed for use in ionizing radiation assessments. The model is being applied to provide 3-D shielding distributions around radiation dosimeters to aid in data interpretation, particularly in assessing the directional properties of the radiation exposure. Also, the model has been interfaced with radiation transport codes for 3-D dosimetry response predictions and for calculations related to determining the accuracy of trapped proton and cosmic ray environment models. The methodology is described used in developing the 3-D LDEF model and the level of detail incorporated. Currently, the trays modeled in detail are F2, F8, and H12 and H3. Applications of the model which are discussed include the 3-D shielding distributions around various dosimeters, the influence of shielding on dosimetry responses, and comparisons of dose predictions based on the present 3-D model vs those from 1-D geometry model approximations used in initial estimates. Author

N92-27237*# Science Applications International Corp., Prospect, TN.
RADIATION MODEL PREDICTIONS AND VALIDATION USING LDEF DATA Abstract Only **c72**
T. W. Armstrong and B. L. Colborn *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 23 (For primary document see N92-27218 18-99)
(Contract NAS8-38566)
Avail: NTIS HC/MF A07

Radiation dosimetry aboard LDEF, as well as post-flight measurements of the radioactivity induced in numerous LDEF spacecraft components, provide unique data for evaluating the accuracy of current models for predicting both the space radiation environments (trapped proton intensity, spectra, and directionality; cosmic ray fluence) and the radiation environments induced in spacecraft components (fluence, energy spectra, secondary particle, linear energy transfer, etc.). By determining the accuracy of such models using LDEF data, and with model updates where required, improved radiation environment predictions can be made for future missions, which in turn allows improved predictions for specific radiation effects for future spacecraft components (single event upsets of microelectronics, radiation damage to focal plane arrays, noise in sensitive instrumentation, etc.). Herein, the status and results from radiation model predictions and comparisons with LDEF data is given. The calculations are made using radiation transport codes coupled with a 3-D geometry/mass model of LDEF, together with current models of the space radiation environment. Author

N92-27238*# Grumman Space Station, Huntsville, AL.
CRITICALITY OF Be-7 CONCENTRATION IN LDEF Abstract Only **c72**
Poh Shien Young *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 24 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Heretofore, a number of papers reported the detection of high Be-7 concentration in the LDEF. It sounded alarming for space flight in the LDEF orbit, since Be-7 has a half life of 54 days and emits gamma rays of 0.48 MeV which is ionizing radiation. Two concerns are raised: the high concentration of harmful rays to spacecraft crews; and the concentration damage to spacecraft electronic components. A need was established to estimate the dosage of this concentration and compare the value of the allowed limits. As a result, the dosage was calculated of 0.03 rad. When this is compared with the human limit of 25 rads and the susceptibility requirement of 800 rads, the Be-7 amount should not be considered critical. The calculation of Be-7 dosage is detailed. Author

N92-27239*# Alabama Univ., Huntsville. Dept. of Chemistry.
COSMOGENIC RADIOISOTOPES ON LDEF SURFACES Abstract Only **c72**
J. C. Gregory, A. Albrecht, G. Herzog, J. Klein, and R. Middleton (Pennsylvania Univ., Philadelphia.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 25 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The radioisotope Be-7 was discovered in early 1990 on the front surface, and the front surface only, of the LDEF. A working hypothesis is that the isotope, which is known to be mainly produced in the stratosphere by spallation of nitrogen and oxygen nuclei with cosmic ray protons or secondary neutrons, diffuses upward and is absorbed onto metal surfaces of spacecraft. The upward transport must be rapid, that is, its characteristic time scale is similar to, or shorter than, the 53 day half-life of the isotope. It is probably by analogy with meteoritic metal atmospheric chemistry, that the form of the Be at a few 100 km altitude is as the positive ion Be(+) which is efficiently incorporated into the ionic lattice of oxides, such as Al2O3, Cr2O3, Fe2O3, etc., naturally occurring on surfaces of Al and stainless steel. Other radioisotopes of Be, Cl, and C are also produced in the atmosphere, and a search was begun to discover these. Of interest are Be-10 and C-14 for which the production cross sections are well known. The method of analysis is accelerator mass spectrometry. Samples from LDEF clamp plates are being chemically extracted, purified, and prepared for an accelerator run. Author

N92-27240*# Naval Research Lab., Washington, DC. Center for Space Research.
HEAVY IONS IN SPACE (HIIS) EXPERIMENT Progress Report Abstract Only **c72**
James H. Adams, Jr., Lorraine P. Beahm, and Allan J. Tylka *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 26 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Heavy Ions In Space (HIIS) experiment has two primary objectives: (1) to measure the elemental composition of ultraheavy Galactic cosmic rays, beginning in the tin-barium region of the periodic table; and (2) to study heavy ions which arrive at LDEF below the geomagnetic cutoff, either because they are not fully stripped of electrons or because their source is within the magnetosphere. Both have practical as well as astrophysical consequences. The HIIS experiment used eight thick stacks of plastic track detectors mounted in two trays on the space facing end of LDEF. Since the last LDEF symposium, the statistics were increased of the observations and have extended the analysis to a second stack and to detector sheets near the top of a stack. New results are reported on the detector resolution and on the observations of both stopping and relativistic particles. Author

N92-27241*# Dublin Inst. for Advanced Studies (Ireland).
ULTRA HEAVY COSMIC RAY EXPERIMENT (A0178) Progress Report Abstract Only **c93**
A. Thompson, D. OSullivan, J. Bosch, R. Keegan, K. P. Wenzel, F. Jansen, and C. Domingo (Universidad Autonoma de Barcelona, Bellaterra, Spain) *In* NASA. Langley Research Center, Second

LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 27 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Ultra Heavy Cosmic Ray Experiment (UHCRE) is based on a modular array of 192 side viewing solid state nuclear track detector stacks. These stacks were mounted in sets of four in 48 pressure vessels using 16 peripheral LDEF trays. The geometry factor for high energy cosmic ray nuclei, allowing for Earth shadowing, was 30 sq m sr, giving a total exposure factor of 170 sq m sr y at an orbital inclination of 28.4 degs. Scanning results indicate that about 3000 cosmic ray nuclei in the charge region with Z greater than 65 were collected. This sample is more than ten times the current world data in the field (taken to be the data set from the HEAO-3 mission plus that from the Ariel-6 mission) and is sufficient to provide the world's first statistically significant sample of actinide cosmic rays. Results are presented including a sample of ultra heavy cosmic ray nuclei, analysis of pre-flight and post-flight calibration events and details of track response in the context of detector temperature history. The integrated effect of all temperature and age related latent track variations cause a maximum charge shift of + or - 0.8e for uranium and + or - 0.6e for the platinum-lead group. Astrophysical implications of the UHCRE charge spectrum are discussed. Author

N92-27242*# Science Applications International Corp., Prospect, TN.
FUTURE DIRECTIONS FOR LDEF IONIZING RADIATION MODELING AND ASSESSMENTS Abstract Only **c72**
T. W. Armstrong and B. L. Colborn *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 28 (For primary document see N92-27218 18-99)
(Contract NAS8-38566)
Avail: NTIS HC/MF A07

Data from the ionizing radiation dosimetry aboard LDEF provide a unique opportunity for assessing the accuracy of current space radiation models and in identifying needed improvements for future mission applications. Details are given of the LDEF data available for radiation model evaluations. The status is given of model comparisons with LDEF data, along with future directions of planned modeling efforts and data comparison assessments. The methodology is outlined which is related to modeling being used to help insure that the LDEF ionizing radiation results can be used to address ionizing radiation issues for future missions. In general, the LDEF radiation modeling has emphasized quick-look predictions using simplified methods to make comparisons with absorbed dose measurements and induced radioactivity measurements of emissions. Modeling and LDEF data comparisons related to linear energy transfer spectra are of importance for several reasons which are outlined. The planned modeling and LDEF data comparisons for LET spectra is discussed, including components of the LET spectra due to different environment sources, contribution from different production mechanisms, and spectra in plastic detectors vs silicon. Author

N92-27243*# Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France).
MICROMETEOROIDS AND DEBRIS ON LDEF Abstract Only **c90**
Jean-Claude Mandeville *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 32 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Part of the LDEF tray allocated to French Experiments (FRECOPA) was devoted to the study of dust particles. The tray was located on the face of LDEF directly opposed to the velocity vector. Two passive experiments were flown: a set of glass and metallic samples; and multilayer thin foil detectors. Crater size distribution made possible the evaluation of the incident microparticle flux in the near environment. Comparisons are made with measurements obtained on the other faces of LDEF and with results from similar experiments on the MIR. Of interest was the study of impact features on stacked thin foil detectors. The top foil acted as a shield, fragmenting the projectiles and spreading the fragments over the surface of the thick plate located underneath. EDS analysis has provided evidence of impactor fragments. Detectors consisting of a thin shield and thick bottom plate appear to offer a significantly higher return of data concerning chemical analysis of impactor residues than single plate detectors. The samples of various materials offer a unique opportunity for the study of the many processes involved upon hypervelocity impact phenomena. Author

N92-27244*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DETAILED EXAMINATION OF LDEF'S FRAME AND THE A0178 THERMAL BLANKETS BY THE METEOROID AND DEBRIS SPECIAL INVESTIGATIONS GROUP Abstract Only **c90**
Thomas H. See, Jack L. Warren, Kimberly S. Mack (Lockheed Engineering and Sciences Co., Houston, TX.), and Michael E. Zolensky *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 33 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

A responsibility of the group is to define the hypervelocity particle environment encountered by LDEF during its stay in low Earth orbit. LDEF's 6061-T6 aluminum frame and the 'Teflon silver-inconel paint' thermal blankets represent large surface areas that were widely distributed around the spacecraft. The results are reported of high resolution scans of approx. 0.36 and approx. 0.31 sq m for the intercostals and thermal blankets, respectively. The findings are in qualitative agreement with existing model predictions that suggest high differential bombardment histories for surfaces pointing into specific directions relative to the velocity vector of a non-spinning platform in LEO. The production rate for craters greater than or = 50 microns in diameter in aluminum and penetration holes greater than or = 100 microns in diameter in thin foil materials differ by more than a factor of 10 between forward and rearward facing surfaces. These are substantial differences that must be considered during the design of future long duration space platforms in LEO. Author

N92-27245*# Aerospace Corp., El Segundo, CA.
LDEF EXPERIMENT M0003 METEOROID AND DEBRIS SURVEY Abstract Only **c90**
M. J. Meshishnek, S. R. Gyetvay, K. W. Paschen, and J. M. Coggi *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 34 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

A survey of the meteoroid and space debris impacts on LDEF experiment M0003 was performed. The purpose was to document impact phenomenology and to obtain impact crater data for comparison to current debris and micrometeoroid models. The survey consists of photomicrographs of significant impacts in a variety of material types, accurate measurements of impact crater coordinates and dimensions for selected experiment surfaces and data basing of the crater data for reduction, manipulation, and comparison models. Large area surfaces which were studied include the experiment power and data system sunshields, environment exposure control canister sunshields, and the M0003 signal conditioning unit covers. Crater diameters down to 25 microns were measured and catalogued. Both leading and trailing edge surfaces were studied and compared. The results shows the different response of materials to hypervelocity impacts. Comparison of the data to curves derived from the Kessler debris model and the Cour-Palais micrometeoroid model indicates a marked tendency for overprediction of small impacts and underprediction of large impacts with there being better agreement for the medium sized impacts. Representative impact data is presented. Author

N92-27246*# POD Associates, Inc., Albuquerque, NM.
DAMAGE AREAS DUE TO IMPACT CRATERS ON LDEF ALUMINUM PANELS Abstract Only **c90**
Cassandra R. Coombs, Dale R. Atkinson, Martha Allbrooks, and

J. D. Wagner *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 35 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Because of its exposure time and total exposed surface area, the LDEF provides a unique opportunity to analyze the effects of the natural and man-made particle populations in low earth orbit (LEO). This study concentrated on collecting and analyzing measurements of impact craters from seven painted aluminum surfaces at different locations on the satellite. These data are being used to: (1) update the current theoretical micrometeoroid and debris models for LEO; (2) characterize the effects of the LEO micrometeoroid and debris environment of satellite components and designs; (3) help assess the probability of collision between spacecraft in LEO and already resident debris and the survivability of those spacecraft that must travel through, or reside in, LEO; and (4) help define and evaluate future debris mitigation and disposal methods. Measurements were collected from one aluminum experiment tray cover (Bay C-12), two aluminum grapple plates (Bays C-01, C-10), and four aluminum experiment sun-shields (Bay E-09), all of which were coated with thermal paint. These measurements were taken at the Facility for Optical Interpretation of Large Surfaces (FOILS) Lab at JSC. Virtually all features greater than 0.2 mm in diameter possessed a spall zone in which all of the paint was removed from the aluminum surface, and which varied in size from 2-5 crater diameters. The actual craters vary from central pits without raised rims to morphologies more typical of craters formed in aluminum under hypervelocity impact conditions for larger features. Most craters exhibit a shock zone that varies in size from approximately 1-20 crater diameters. In general, only the outermost layer of paint was affected by this impact-related phenomenon, with several impacts possessing ridge-like structures encircling the area in which this outer-most paint layer was removed. Overall, there were no noticeable penetrations or bulges on the underside of the trays. One tray from the E-09 bay exhibited a spallation zone on the backside, approximately equal in size to that on the front side. Results from this study demonstrate that the impact damaged areas extend far beyond the actual craters in coated or painted surfaces. While the cratering damaged much greater than 1 percent of the total surface area, the total impact damage area exceeded 3 percent. Author

N92-27247*# Vanderbilt Univ., Nashville, TN. Dept. of Materials Science and Engineering.
MECHANICAL PROPERTIES OF GLASSES IMPACTED BY DEBRIS OR MICROMETEORITES Abstract Only **c27**
Donald L. Kinser and David E. Wiedlocher *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 36 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Mechanical strength measurements on five glasses and one glass ceramic exposed on the Long Duration Exposure Facility (LDEF) have revealed no damage exceeding experimental limits of error after exposure. The measurement technique subjected less than 5 percent of the sample surface area to stresses above 90 percent of the failure strength. Seven micrometeorite or space debris impacts occurred at locations which were not in that portion of the sample subjected to greater than 90 percent of the applied stress. In consequence of this, the impact events on the sample were not detected in mechanical strength measurements. The physical form and structure of the impact sites was carefully examined to determine the influence of those events upon stress concentration associated with the impact and the resulting mechanical strength influence. The size of the impact site insofar as it determines flaw size for fracture purposes was examined. Surface topography of the impacts reveals that six of the seven sites display impact melting. The classical melt crater structure is surrounded by a zone of fractured glass. Residual stresses arising from shock compression and from cooling of the impact fused zone cannot be included in fracture mechanics analyses based on simple flaw size analyses. Strategies for refining estimates of mechanical strength degradation by impact events are presented. Author

N92-27248*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
ANALYSIS OF LDEF MICROMETEOROID/DEBRIS DATA AND DAMAGE TO COMPOSITE LAMINATES Abstract Only **c24**
R. C. Tennyson *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 37 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

A nomogram based on the number/distribution of micrometeoroid/debris hits recorded on the Long Duration Exposure Facility (LDEF) is presented. The nomogram permits the user to estimate the total number of impacts that a space structure would encounter as a function of time in orbit, exposed area, and angular location associated with the LDEF. Examples are presented on the application of the nomogram to satellites and space structures of different cross-sections to that of the LDEF. The effects of altitude and orbit inclination are also discussed. To further demonstrate the usefulness of this nomogram, results are compared to impact data measured on the UTIAS polymer matrix composite experiment (AO180). The impact damage occurring on these composite materials is examined, and data on hole size, penetration depth, and delamination area are presented. Author

N92-27249*# Kent Univ., Canterbury (England). Unit for Space Sciences.
LDEF'S MAP EXPERIMENT FOIL PERFORATIONS YIELD HYPERVELOCITY IMPACT PENETRATION PARAMETERS Abstract Only **c90**
J. A. M. McDonnell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 38 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The space exposure of LDEF for 5.75 years, forming a host target in low earth orbit (LEO) orbit to a wide distribution of hypervelocity particulates of varying dimensions and different impact velocities, has yielded a multiplicity of impact features. Although the projectile parameters are generally unknown and, in fact not identical for any two impacts on a target, the great number of impacts provides statistically meaningful basis for the valid comparison of the response of different targets. Given sufficient impacts for example, a comparison of impact features (even without knowledge of the project parameters) is possible between: (1) differing material types (for the same incident projectile distribution); (2) differing target configurations (e.g., thick and thin targets for the same material projectiles; and (3) different velocities (using LDEF's different faces). A comparison between different materials is presented for infinite targets of aluminum, Teflon, and brass in the same pointing direction; the maximum finite-target penetration (ballistic limit) is also compared to that of the penetration of similar materials comprising of a semi-infinite target. For comparison of impacts on similar materials at different velocities, use is made of the pointing direction relative to LDEF's orbital motion. First, however, care must be exercised to separate the effect of spatial flux anisotropies from those resulting from the spacecraft velocity through a geocentrically referenced dust distribution. Data comprising thick and thin target impacts, impacts on different materials, and in different pointing directions is presented; hypervelocity impact parameters are derived. Results are also shown for flux modeling codes developed to decode the relative fluxes of Earth orbital and unbound interplanetary components intercepting LDEF. Modeling shows the west and space pointing faces are dominated by interplanetary particles and yields a mean velocity of 23.5 km/s at LDEF, corresponding to a V(infinity) Earth approach velocity = 20.9 km/s. Normally resolved average impact velocities on LDEF's cardinal point faces are shown. As 'excess' flux on the east, north, and south faces is observed, compatible with an Earth orbital component below some 5 microns in particle diameter. Author

N92-27250*# Auburn Univ., AL. Space Power Inst.
HYPERVELOCITY IMPACT FACILITY FOR SIMULATING MATERIALS EXPOSURE TO IMPACT BY SPACE DEBRIS
Abstract Only **c90**
M. Frank Rose, S. G. Best, T. Chaloupka, and B. Stephens *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 39 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Space Power Institute at Auburn University has constructed an electromagnetically driven particle accelerator for simulating the effects of space debris on the materials for use in advanced spacecraft. The facility consists of a capacitively driven accelerator section, a drift tube and a specimen impact chamber. The drift tube is sufficiently long that all electrical activity has ceased prior to impact in the specimen chamber. The impact chamber is large enough to allow a wide range of specimen geometries, ranging from small coupons to active portions of advanced spacecraft. The electric drive for the accelerator consists of a 67 kJ, 50 k capacitor bank arranged in a low inductance configuration. The bank is discharged through an aluminum armature/plastic ablator plate/projectile load in roughly 1.2 microsec. The evaporation of the ablaitor plate produces an expanding gas slug, mostly H2, traveling at a velocity of some 60 km/sec. Because of the pressure and local density, the expanding gas cloud accelerates projectiles due to plasma drag. To date, we have utilized projectiles consisting of 100 micron SiC, 100 and 400 micron Al2O3, 100 and 145 micron olivines. Since many particles are accelerated in a given experiment, there is a range of velocities for each shot as well as some particle breakup. Advanced diagnostics techniques allow determination of impact coordinates, velocity, and approximate size for as many as 50 individual impacts in a given experiment. We routinely measure velocities in the range 1-15 km/sec. We have used this facility to study a variety of impact generated phenomena on coated surfaces, both paint and plastic, thermal blanket material, solar cell arrays, and optical materials such as glass and quartz lenses. The operating characteristics of the gun, the advanced diagnostic scheme, and the results of studies of crater morphology are described in detail. Projectile residue analysis, as a function of impact velocity for the materials listed above, is also discussed. Wherever possible, these results are compared to those obtained by LDEF investigators and future experiments suggested which could help to explain unique features associated with LDEF impacts. Author

N92-27251*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
METEOROID AND DEBRIS SPECIAL INVESTIGATION GROUP; STATUS OF 3-D CRATER ANALYSIS FROM BINOCULAR IMAGERY Abstract Only **c90**
Clyde A. Sapp, Thomas H. See (Lockheed Engineering and Sciences Co., Houston, TX.), and Michael E. Zolensky *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 40 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

During the 3 month deintegration of the LDEF, the M&D SIG generated approximately 5000 digital color stereo image pairs of impact related features from all space exposed surfaces. Currently, these images are being processed at JSC to yield more accurate feature information. Work is currently underway to determine the minimum number of data points necessary to parametrically define impact crater morphologies in order to minimize the man-hour intensive task of tie point selection. Initial attempts at deriving accurate crater depth and diameter measurements from binocular imagery were based on the assumption that the crater geometries were best defined by paraboloid. We made no assumptions regarding the crater depth/diameter ratios but instead allowed each crater to define its own coefficients by performing a least-squares fit based on user-selected tiepoints. Initial test cases resulted in larger errors than desired, so it was decided to test our basic assumptions that the crater geometries could be parametrically defined as paraboloids. The method for testing this assumption was to carefully slice test craters (experimentally produced in an appropriate aluminum alloy) vertically through the center resulting in a readily visible cross-section of the crater geometry. Initially, five separate craters were cross-sectioned in this fashion. A digital image of each cross-section was then created, and the 2-D crater geometry was then hand-digitized to create a table of XY position for each crater. A 2nd order polynomial (parabolic) was fitted to the data using a least-squares approach. The differences between the fit equation and the actual data were fairly significant, and easily large enough to account for the errors found in the 3-D fits. The differences between the curve fit and the actual data were consistent between the caters. This consistency suggested that the differences were due to the fact that a parabola did not sufficiently define the generic crater geometry. Fourth and 6th order equations were then fitted to each crater cross-section, and significantly better estimates of the crater geometry were obtained with each fit. Work is presently underway to determine the best way to make use of this new parametric crater definition. Author

N92-27252*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CHARACTERISTICS OF HYPERVELOCITY IMPACT CRATERS ON LDEF EXPERIMENT S1003 AND IMPLICATIONS OF SMALL PARTICLE IMPACTS ON REFLECTIVE SURFACES
Abstract Only **c90**
Michael J. Mirtich and James E. Merrow (Cleveland State Univ., OH.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 41 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Ion Beam Textured and Coated Surfaces Experiment (IBEX) was designated S1003 on the Long Duration Exposure Facility (LDEF) at a location of 98 degrees relative to the ram direction. Thirty-six diverse materials were exposed to the micrometeoroid (and some debris) environment for 5.8 years. Optical property measurements indicated no changes for almost all of the materials except S-13G, Kapton, and Kapton-coated surfaces, and these changes can be explained by other environmental effects. From the predicted micrometeoroid flux of NASA SP-8013, no changes in optical properties of the surfaces due to micrometeoroids were expected. However, there were hypervelocity impacts on the various diverse materials flown on IBEX. The characteristics of these craters were documented using scanning electron microscopy (SEM) and are presented. Interest in placing large solar concentrator/solar dynamic systems in space for power generation has again brought up a concern for maintaining the integrity of the optical properties of highly specular reflecting surfaces in the near-Earth space environment. It has been shown that highly reflective polished metals and thin film coatings degrade when exposed to simulated micrometeoroids in the laboratory. At LeRC, a shock tube was used to simulate the phenomenon of micrometeoroid optical properties of surfaces exposed to this impact were then evaluated. A calibrated sensor, 2000 A Al/stainless steel, was developed to not only detect the small size micrometeoroid environment, but also to evaluate the degradation of the optical properties of thin aluminum films in space. This sensor was flown on LDEF experiment S1003 and also on the OSO 3 and SERT 2 satellites that were launched in 1967 and 1970, respectively. No changes in the optical properties of the highly reflective surface sensor on SERT 2 were measured during 20 years in space. The results, as determined by the accuracy of the sensor, indicate that a highly reflective surface should lose less than 1 percent of its specular reflectance in near-Earth orbit during 20 years. Author

N92-27253*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LONG DURATION EXPOSURE FACILITY (LDEF) ATTITUDE MEASUREMENTS OF THE INTERPLANETARY DUST EXPERIMENT Abstract Only **c90**
Philip C. Kassel, Jr., S. Fred Singer, J. Derral Mulholland, John P. Oliver, Jerry L. Weinberg, William J. Cooke, Jim J. Wortman (North Carolina State Univ., Raleigh.), and William R. Motley, III *In its*

Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 42 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Long Duration Exposure Facility (LDEF) Interplanetary Dust Experiment (IDE) was unique in providing a time history of impacts of micron-sized particles on six orthogonal faces of LDEF during the first year in orbit. The value of this time resolved data depended on and was enhanced by the proper operation of some basic LDEF systems. Thus, the value of the data is greatly enhanced when the location and orientation of LDEF is known for each time of impact. The location and velocity of LDEF as a function of time can be calculated from the 'two-line elements' published by GSFC during the first year of the LDEF mission. The attitude of LDEF was passively stabilized in a gravity-gradient mode and a magnetically anchored viscous damper was used to dissipate roll, pitch, and yaw motions. Finally, the IDE used a standard LDEF Experiment Power and Data System (EPDS) to collect and store data and also to provide a crystal derived clock pulse (1 count every 13.1072 seconds) for all IDE time measurements. All that remained for the IDE was to provide a system to calibrate the clock, eliminating accumulative errors, and also verify the attitude of LDEF. The IDE used solar cells on six orthogonal faces to observe the LDEF sunrise and provide data about the LDEF attitude. The data was recorded by the EPDS about 10 times per day for the first 345 days of the LDEF mission. This data consist of the number of IDE counts since the last LDEF sunrise and the status of the six solar cells (light or dark) at the time of the last IDE count. The EPDS determined the time that data was recorded and includes, with each record, the master EPDS clock counter (1 count every 1.6384 seconds) that provided the range and resolution for time measurements. The IDE solar cells provided data for an excellent clock calibration, meeting their primary purpose, and the time resolved LDEF attitude measurements that can be gleaned from this data are presented. Author

N92-27254*# Observatoire de la Cote d'Azur, Nice (France).
LONG-TERM PARTICLE FLUX VARIABILITY INDICATED BY COMPARISON OF INTERPLANETARY DUST EXPERIMENT (IDE) TIMED IMPACTS FOR LDEF'S FIRST YEAR IN ORBIT WITH IMPACT DATA FOR THE ENTIRE 5.75-YEAR ORBITAL LIFETIME Abstract Only **c90**
J. Derral Mulholland, Charles G. Simon, William J. Cooke, John P. Oliver, and V. Misra (North Carolina State Univ., Raleigh.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 43 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The electronic sensors of the Interplanetary Dust Experiment (IDE) recorded precise impact times and approximate directions for submicron to approximately 100-micron size particles on all six primary sides of the spacecraft for the first 346 days of the Long Duration Exposure Facility (LDEF) orbital mission. Previously-reported analyses of the timed impact data have established their spatio-temporal features, including the demonstration that a preponderance of the particles in this regime are orbital debris and that a large fraction of the debris particles are encountered as megameter-size clouds, some of which persist for long times. Short-term fluxes within such clouds can rise several orders of magnitude above the long-term average. These finding are consistent with the results of the first catastrophic hypervelocity laboratory impacts on a real satellite, recently reported in the press. Analysis continues on the geometric and evolutionary characteristics of these clouds, as well as on the isolation and characterization of the natural micrometeoroid component in the IDE data, but the unexpectedly large short-term variations in debris flux raises the question of how representative an indication of the multi-year average flux is given by the nearly one year of timed data. It has, therefore, always been one of the goals of IDE to conduct an optical survey of the craters on the IDE detectors, to obtain full-mission fluxes for comparisons with the timed data. This work is underway, and the results presently in hand are significant. Optical scanning of the ram and wake (East and West) panels is complete, and it is clear that the first year was in some respects not representative of the subsequent years. The 5.75-year average flux on East panel was 90 percent of the value predicted by the average flux recorded during the first year, while it was only 34 percent on West panel. This suggests that western hemisphere spacecraft launches are a major contributor to the long-term flux and that their contribution is primarily in the smaller end of the size distribution. This conclusion follows from the fact that a closely-spaced series of launch failures (Titan, Delta, Ariane, and Challenger) caused a virtual hiatus in launch activity during a large part of the later years of the LDEF mission. We hope to provide a quantification of the particle size distribution function in this case. Author

N92-27255*# Institute for Space Science and Technology, Inc., Gainesville, FL.
ELEMENTAL ANALYSES OF HYPERVELOCITY MICRO-PARTICLE IMPACT SITES ON INTERPLANETARY DUST EXPERIMENT SENSOR SURFACES Abstract Only **c90**
Charles G. Simon, J. L. Hunter, D. P. Griffis, V. Misra, D. R. Ricks, and Jim J. Wortman (North Carolina State Univ., Raleigh.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 44 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Interplanetary Dust Experiment (IDE) had over 450 electrically active ultra-high purity metal-oxide-silicon impact detectors located on the six primary sides of the Long Duration Exposure Facility (LDEF). Hypervelocity micro-particles that struck the active sensors with enough energy to breakdown the 0.4 to 1.0 micron thick SiO2 insulator layer separating the silicon base (the negative electrode), and the 1000 A thick surface layer of aluminum (the positive electrode) caused electrical discharges that were recorded for the first year of orbit. These discharge features, which include 50 micron diameter areas where the aluminum top layer has been vaporized, facilitate the location of the impacts. The high purity Al-SiO2-Si substrates allow detection of trace (ppm) amounts of hypervelocity impactor residues. After sputtering through a layer of surface contamination, secondary ion mass spectrometry (SIMS) is used to create two-dimensional elemental ion intensity maps of micro-particle impact sites on the IDE sensors. The element intensities in the central craters of the impacts are corrected for relative ion yields and instrumental conditions and then normalized to silicon. The results are used to classify the particles' origins as 'manmade', 'natural' or 'indeterminate'. The last classification results from the presence of too little impactor residue (a frequent occurrence on leading edge impacts), analytical interference from high background contamination, the lack of information on silicon residue, the limited usefulness of data on aluminum in the central craters, or a combination of these circumstances. Several analytical 'blank' discharges were induced on flight sensors by pressing down on the sensor surface with a pure silicon shard. Analyses of these blank discharges showed that the discharge energy blasts away the layer of surface contamination. Only Si and Al were detected inside the discharge zones, including the central craters, of these features. A total of 35 impacts on leading edge sensors and 22 impacts on trailing edge sensors were analyzed. Author

N92-27256*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SCANNING ELECTRON MICROSCOPE/ENERGY DISPERSIVE X RAY ANALYSIS OF IMPACT RESIDUES ON LDEF TRAY CLAMPS Abstract Only **c90**
Ronald P. Bernhard, Christian Durin (Centre National d'Etudes Spatiales, Toulouse, France), and Michael E. Zolensky *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 45 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

To better understand the nature of particulates in low-Earth orbit (LEO), and their effects on spacecraft hardware, we are analyzing residues found in impacts on the Long Duration Exposure Facility (LDEF) tray clamps. LDEF experiment trays were held in

place by 6 to 8 chromic-anodized aluminum (6061-T6) clamps that were fastened to the spacecraft frame using three stainless steel hex bolts. Each clamp exposed an area of approximately 58 sq cm (4.8 cm x 12.7 cm x .45 cm, minus the bolt coverage). Some 337 out of 774 LDEF tray clamps were archived at JSC and are available through the Meteoroid & Debris Special Investigation Group (M&D SIG). Optical scanning of clamps, starting with Bay/Row A01 and working toward H25, is being conducted at JSC to locate and document impacts as small as 40 microns. These impacts are then inspected by Scanning Electron Microscopy/Energy Dispersive X-ray Analysis (SEM/EDXA) to select those features which contain appreciable impact residue material. Based upon the composition of projectile remnants, and using criteria developed at JSC, we have made a preliminary discrimination between micrometeoroid and space debris residue-containing impact features. Presently, 13 impacts containing significant amounts of unmelted and semi-melted micrometeoritic residues were forwarded to Centre National d'Etudes Spatiales (CNES) in France. At the CNES facilities, the upgraded impacts were analyzed using a JEOL T330A SEM equipped with a NORAN Instruments, Voyager X-ray Analyzer. All residues were quantitatively characterized by composition (including oxygen and carbon) to help understand interplanetary dust as possibly being derived from comets and asteroids. Author

N92-27257*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

COMPOSITIONAL ANALYSIS OF PROJECTILE RESIDUES ON LDEF INSTRUMENT AO187-1 Abstract Only **c90**

Ronald P. Bernhard (Lockheed Engineering and Sciences Co., Houston, TX.) and F. Horz *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 46 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

Impact craters greater than 30 microns and associated projectile residues were analyzed by Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Analysis (EDXA). Objectives were to analyze a statistically significant number of projectiles to evaluate their chemical variability and possible clustering into discrete particle types. Bay A11 exposed six collector surfaces of anodized 1100-T4 (greater than 99 percent pure) aluminum sheets, 0.32 cm thick, yielding an exposed surface area of 1.1 sq. m. Four of the six panels have been retained at JSC, and were optically scanned, one (A11E00E) was prepared for SEM/EDX analysis. Bay A03 was occupied by high purity (99.99 percent) gold sheets, 0.5 mm thick, yielding an exposed surface area of 0.85 sq. m. Sample processing included the optical scanning (6X), labeling, and dislodging (by a punch-die device) of each individual impact greater than 75 microns for the aluminum and 30 microns for the gold. The 209 craters were dislodged form A11E00E, having crater diameters up to 3500 microns. Optical examination of the gold surfaces detected 238 craters, 198 of which were retained at JSC and analyzed via SEM/EDX. The analytical procedures included maximizing the geometric efficiency (take-off angles), using relatively long count times (500-1000 sec) and sufficiently high accelerating currents (25-30Kev). Despite diligent examination, a large number of craters did not exhibit measurable signals above background. Detectable resides were classified as either micrometeoritic or as man-made debris. Author

N92-27258*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

INTERPLANETARY METEOROID DEBRIS IN LDEF METAL CRATERS Abstract Only **c90**

D. E. Brownlee, F. Horz, and J. Bradley (McCrone Associates, Inc., Westmont, IL.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 47 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

The extraterrestrial meteoroid residue found lining craters in the Long Duration Exposure Facility (LDEF) aluminum and gold targets is highly variable in both quantity and type. In typical craters only a minor amount of residue is found and for these craters it is evident that most of the impacting projectile was ejected during crater formation. Less than 10 percent of the craters greater than 100 microns contain abundant residue consistent with survival of a major fraction of the projectile. In these cases the residue can be seen optically as a dark liner and it can easily be analyzed by SEM-EDX techniques. Because they are rare, the craters with abundant residue must be a biased sampling of the meteoroids reaching the earth. Factors that favor residue retention are low impact velocity and material properties such as high melting point. In general, the SEM-EDX observations of crater residues are consistent with the properties of chondritic meteorites and interplanetary dust particles collected in the stratosphere. Except for impacts by particles dominated by single minerals such as FeS and olivine, most of the residue compositions are in broad agreement with the major element compositions of chondrites. In most cases the residue is a thin liner on the crater floor and these craters are difficult to quantitatively analyze by EDX techniques because the electron beam excites both residue and underlying metal substrate. In favorable cases, the liner is thick and composed of vesicular glass with imbedded FeNi, sulfide and silicate grains. In the best cases of meteoroid preservation, the crater is lined with large numbers of unmelted mineral grains. The projectiles fragmented into micron sized pieces but the fragments survived without melting. In one case, the grains contain linear defects that appear to be solar flare tracks. Solar flare tracks are common properties of small interplanetary particles and their preservation during impact implies that the fragments were not heated above 600 C. We are investigating the meteoroid fragments in LDEF metal craters to determine the properties of interplanetary dust and to determine if there are meteoroid types that are overlooked or otherwise undetected in cosmic dust collections obtained from the stratosphere and polar ice. Author

N92-27259*# Washington Univ., Saint Louis, MO. Center for Space Sciences.

SIMS CHEMICAL ANALYSIS OF EXTENDED IMPACTS ON THE LEADING AND TRAILING EDGES OF LDEF EXPERIMENT AO187-2 Abstract Only **c90**

S. Amari, J. Foote, Charles G. Simon, P. Swan, R. M. Walker, E. Zinner, E. K. Jessberger, G. Lange, and F. Stadermann (Max-Planck-Inst. fuer Kernphysik, Heidelberg, Germany, F.R.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 48 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

The Long Duration Exposure Facility (LDEF) Experiment AO187-2 consisted of 237 capture cells, 120 on the leading edge and 117 on the trailing edge. Each cell was made of polished Ge plates covered with 2.5 micron thick mylar foil at 200 microns from the Ge. Although all leading edge cells and 105 trailing edge cells had lost their plastic covers during flight, optical and electron microscope examination revealed extended impacts in bare cells from either edge that apparently were produced by high velocity projectiles while the plastic foils were still in place. Detailed optical scanning yielded 53 extended impacts on 100 bare cells from the trailing edge that were selected for SIMS chemical analysis. Lateral multi-element ion probe profiles were obtained on 40 of these impacts. Material that can be attributed to the incoming projectiles was found in all analyzed extended compact features and most seem to be associated with cosmic dust particles. However, LDEF deposits are systematically enriched in the refractory elements Al, Ca, and Ti relative to Mg and Fe when compared to IDP's collected in the stratosphere and to chondritic compositions. These differences are most likely due to elemental fractionation effects during the high velocity impact but real differences between interplanetary particles captured on LDEF and stratospheric IDP's cannot be excluded. Recently we extended our studies to cells from the leading edge and the covered cells from the trailing edge. The 12 covered cells contain 20 extended impact candidates. Ion probe analysis of 3 yielded results similar to those obtained for impacts on the bare cells from the trailing edge. Optical scanning of the bare leading edge cell also reveals many extended impacts (42 on 22 cells scanned to date), demonstrating that the cover

foils remained intact at least for some time. However, SIMS analysis showed elements that can reasonably be attributed to micrometeoroids in only 2 out of 11 impacts. Eight impacts have residues dominated by Al and one dominated by Ti, indicating a preponderance of orbital debris in leading edge impacts. Author

N92-27260*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

FURTHER ANALYSIS OF LDEF FRECOPA MICROMETEROID REMNANTS Abstract Only c90

J. Borg, T. E. Bunch, and Filippo RadicatidiBrozolo (Evans, Charles and Associates, Redwood City, CA) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 49 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Experiments dedicated to the detection of interplanetary dust particles (IDP's) were exposed within the FRECOPA payload, installed on the face of the LDEF directly opposed to the velocity vector (west facing direction, location B3). We were mainly interested in the analysis of hypervelocity impact features of sizes less than or = 10 microns, found in thick Al targets devoted to the research of impact features. In the 15 craters found in the scanned area (approximately 4 sq. cm), the chemical analysis suggests an extraterrestrial origin for the impacting particles. The main elements we identified are usually refered to as chondrite elements: Na, Mg, Si, S, Ca, and Fe are found in various proportions, intrinsic Al being masked by the Al target; we notice a strong depletion in Ni, never observed in our samples. Furthermore, C and O are present in 90 percent of the cases; the C/O peak height ratio varies from 0.1 to 3. Impactor simulations by light gas gun hypervelocity impact experiments have shown that meaningful biogenic element and compound information maybe obtained from IDP residues below impacts of critical velocities, that are less than or = 4 km/sec for particles larger than 100 microns in diameter. Our results obtained for the smaller size fraction IDP's suggest that at such sizes, the critical velocity could be higher by a factor of 2 or 3, as chemical analysis of the remnants were possible in all the identified impact craters, performed on targets possibly hit at velocities greater than or = 7.5 km/s, which is the spacecraft velocity. These samples are now subjected to an imagery and analytical protocol that includes FESEM (field emission scanning electron microscopy) and LIMS (laser ionization mass spectrometry). The LIMS analyses were performed using the LIMA-ZA instrument. Results are presented, clearly indicating that such small events show crater features analogous to what is observed at larger sizes; our first analytical results, obtained for 2 events (P6 and P10) suggest that N is present in the IDP's remnants in which C and O were identified by EDX analysis. In one case (P6), enrichment in K and P is observed. Surface contamination by NaCl is evident on the FRECOPA surfaces. Author

N92-27261*# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).

PREDICTED AND OBSERVED DIRECTIONAL DEPENDENCE OF METEOROID/DEBRIS IMPACTS ON LDEF THERMAL BLANKETS Abstract Only c90

Gerhard Drolshagen *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 50 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The number of impacts from meteoroids and space debris particles to the various Long Duration Exposure Facility (LDEF) rows is calculated using ESABASE/DEBRIS, a 3-D numerical analysis tool. It is based on the latest environment flux models and includes geometrical and directional effects. A detailed comparison of model predictions and actual observations is made for impacts on the thermal blankets which covered the USCR experiment. Impact features on these blankets were studied intensively in European laboratories and hypervelocity impacts for calibration were performed. The thermal blankets were located on all LDEF rows, except 3, 9, and 12. Because of their uniform composition and thickness, these blankets allow a direct analysis of the directional dependence of impacts and provide a unique test case for the latest meteoroid and debris flux models. Author

N92-27262*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

OBSERVATION OF FULLERENES (C60-C70) ASSOCIATED WITH LDEF CRATER NUMBER 31 Abstract Only c25

Filippo RadicatidiBrozolo, R. H. Fleming (Evans, Charles and Associates, Redwood City, CA), and T. E. Bunch *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 51 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The presence of fullerenes in and around the LDEF crater number 31 is reported. This crater has a high C level associated with it, and is interpreted as having been produced by the impact of a C-rich micrometeoroid. Fullerenes are large 3-D C structures, among which the species C sub 60 (MW 720) and C sub 70 (MW 840) are preeminent. Fullerenes have several UV absorption bands, hence fullerenes should be detectable using UV laser ionization time-of-flight mass spectrometry. We use a LIMA-2A instrument with pulsed UV laser (266 nm) to search for high mass C species associated with LDEF crater number 31. The mass range was 0 to 1200 amu. Low ablating laser power levels were used (less than or = 5 x 10 exp 7 W/sq. cm); 200 mass spectra were acquired and summed. We observed high mass signals near m/z 720, exhibiting 24 amu separation, which is characteristic of fullerenes. Alkali ion signals were also observed. Little or no C clusters of intermediate mass were observed. We interpret the signals around m/z 720 as fullerenes, mainly C sub 60+ with lower levels of C sub 70+. We propose that the mechanism that produces these signals is resonant multiphoton ionization (REMPI). This selective mechanism explains why low mass C cluster ions are not observed along with the fullerenes, since they have much higher ionization potentials. This finding is unexpected, since up to now the search for fullerenes in extraterrestrial materials has not been successful. We conclude that the fullerenes became associated with crater number 31 in space. Two alternative (and exciting) scenarios are being considered at this time: either the fullerenes were carried by the C-rich projectile that formed crater number 31, or the fullerenes formed upon impact with the LDEF. We show the results of experiments at the ARC Vertical Gun Facility, which may establish some constraints on the origin of the fullerenes. Author

N92-27263*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

ASTEROIDAL VERSUS COMETARY METEOROID IMPACTS ON THE LONG DURATION EXPOSURE FACILITY (LDEF) Abstract Only c90

Herbert A. Zook *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 52 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Meteoroids that enter the Earth's atmosphere at low velocities will tend to impact the apex side (that surface facing the spacecraft direction of motion) of a spacecraft at a very high rate compared to the rate with which they will impact an antapex-facing surface. This ratio -- apex to antapex impact rates -- will become less as meteoroid entry velocities increase. The measured ratio, apex to antapex, for 500 micron diameter impact craters in 6061-T6 aluminum on LDEF seems to be about 20 from the work of the meteoroid SIG group and from the work of Humes that was presented at the first LDEF symposium. Such a ratio is more consistent with the meteoroid velocity distributions derived by Erickson and by Kessler, than it is with others that have been tested. These meteoroid velocity distributions have mean entry velocities into the Earth's atmosphere of 16.5 to 16.9 km/s. Jackson and Zook (in a paper submitted to Icarus) have numerically simulated the orbital evolution of small dust grains emitted from asteroids and comets. For those asteroidal grains small enough

(below about 100 microns diameter) to drift from the asteroid belt to the orbit of the Earth, under P-R and solar wind drag, without suffering collisional destruction, the following results are found: as their ascending or descending nodes cross the Earth's orbit (and when they might collide with the Earth), their orbital eccentricities and inclinations are quite low (e less than 0.3, i less than 20 degrees), and their mean velocity with respect to the Earth is about 5 or 6 km/s. When gravitational acceleration of the Earth is taken into account, the corresponding mean velocities relative to the top of the Earth's atmosphere are 12 to 13 km/s. This means that, at best, these small asteroidal particles can not comprise more than 50 percent of the particles entering the Earth's atmosphere. And when gravitational focusing is considered, they cannot comprise more than a few percent of those in heliocentric orbit at 1 AU. The rest are presumably of cometary origin.

Author

N92-27264*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

ORIGIN OF ORBITAL DEBRIS IMPACTS ON LONG DURATION EXPOSURE FACILITY'S (LDEF) TRAILING SURFACES Abstract Only **c90**

Donald J. Kessler *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 53 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

Orbital debris tracked by the US Space Command is mostly in near circular orbit around the Earth. If small debris were in the same types of orbits, there would be very few orbital debris impacts on the Long Duration Exposure Facility's (LDEF's) trailing surfaces. However, at least 15 percent of the impacts found on the trailing A03 gold surface was found to be orbital debris impacts. This measurement suggests that the orbital distribution of small debris is not the same as that of larger debris. Although this is not a total surprise, since modelling of satellite breakups has predicted different distributions, it does raise questions as to what types of orbits could be responsible for these impacts. A model was developed to explain these LDEF results. The model calculates the expected debris impact crater distribution around LDEF, as a function of debris orbital parameters. The results show that only low inclination and highly elliptical orbits could be responsible for these impacts. The most common object left in this type of orbit is an orbital transfer stage, used by the US and ESA to place objects into geosynchronous orbit, and inclinations near 28 and 7 degrees for the US and ESA, respectively. Even large fragments from satellites, which break up in these types of orbits, are difficult to observe from the ground; consequently, little is known about the number and characteristics of breakups in these orbits. The LDEF data suggest that these objects are breaking up. The LDEF data also suggest that the ratio of the contribution of small debris from this type of orbit to the contribution from circular orbits is about an order of magnitude larger than the same ratio for debris tracked by the US Space Command. Author

N92-27265*# POD Associates, Inc., Albuquerque, NM.

MODELLING THE NEAR-EARTH SPACE ENVIRONMENT USING LDEF DATA Abstract Only **c46**

Dale R. Atkinson, Cassandra R. Coombs, Lawrence B. Crowell, and Alan J. Watts *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 54 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

Near-Earth space is a dynamic environment, that is currently not well understood. In an effort to better characterize the near-Earth space environment, this study compares the results of actual impact crater measurement data and the Space Environment (SPENV) Program developed in-house at POD, to theoretical models established by Kessler (NASA TM-100471, 1987) and Cour-Palais (NASA SP-8013, 1969). With the continuing escalation of debris there will exist a definite hazard to unmanned satellites as well as manned operations. Since the smaller non-trackable debris has the highest impact rate, it is clearly necessary to establish the true debris environment for all particle sizes. Proper comprehension of the near-Earth space environment and its origin will permit improvement in spacecraft design and mission planning, thereby reducing potential disasters and extreme costs. Results of this study directly relate to the survivability of future spacecraft and satellites that are to travel through and/or reside in low Earth orbit (LEO). More specifically, these data are being used to: (1) characterize the effects of the LEO micrometeoroid an debris environment on satellite designs and components; (2) update the current theoretical micrometeoroid and debris models for LEO; (3) help assess the survivability of spacecraft and satellites that must travel through or reside in LEO, and the probability of their collision with already resident debris; and (4) help define and evaluate future debris mitigation and disposal methods. Combined model predictions match relatively well with the LDEF data for impact craters larger than approximately 0.05 cm, diameter; however, for smaller impact craters, the combined predictions diverge and do not reflect the sporadic clouds identified by the Interplanetary Dust Experiment (IDE) aboard LDEF. The divergences cannot currently be explained by the authors or model developers. The mean flux of small craters (approximately 0.05 cm diameter) is overpredicted by Kessler and underpredicted by Cour-Palais. This divergence may be a result of beta-meteoroid fluxes, elliptical orbits or a combination of the two. The results of this study illustrate the definite need for more intensive study of the near-Earth space environment, particularly the small particle regime, as it is the most degrading to spacecraft in LEO. Author

N92-27266*# Utah State Univ., Logan. Coll. of Science.

THE INTERSTELLAR GAS EXPERIMENT: ANALYSIS IN PROGRESS Abstract Only **c60**

F. Buehler, D. L. Lind, J. Geiss, and O. Eugster *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 55 (For primary document see N92-27218 18-99)

Avail: NTIS HC/MF A07

The interstellar gas experiment (IGE) exposed thin metallic foils in order to collect neutral interstellar particles which penetrate the solar system due to their motion relative to the sun. These atoms were entrapped in the collecting foils along with precipitating magnetospheric ions and with ambient atmospheric atoms. For the entire duration of the LDEF mission, seven of the foils collected particles arriving from seven different directions as seen from the spacecraft. In the mass spectrometric analysis of the trapped noble gas component, we detected the He-3, He-4, Ne-20, and Ne-22 isotopes. In order to infer the isotopic ratios in the interstellar medium from the measured concentrations found in the foil piece, several lines of investigation had to be initiated. The flux of incident noble gas atoms from the ambient atmosphere was estimated by detailed calculations. The contributions proved to be negligible, supporting the experimental evidence. Foil and machine backgrounds for the four isotopes which were measured had to be assessed individually. While this was easy for He-4, spurious foil background of He-3 had to be monitored carefully by analyzing unflown foil pieces. Trapped Ne concentrations are not far above the background. During the flight, a stuck electrical relay precluded the foil-trays from sequencing as designed. Therefore, we could not use the seasonal variation of the direction of the incoming interstellar atoms to make the distinction between interstellar and magnetospheric components of the trapped particles. Instead, we had to try the method of stepwise heating to extract the interstellar component at lower temperatures than we use to extract the magnetospheric component (the interstellars hit the foil with lower energies than most of the magnetospherics). New limiting values for the isotopic composition of the interstellar medium, unavailable yet from any other method of measurement, are emerging from this analysis. Author

N92-27267*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NEW METEOROID MODEL PREDICTIONS FOR DIRECTIONAL IMPACTS ON LDEF Abstract Only **c90**

Neil Divine and Rene C. Aguero *In* NASA. Langley Research

Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 56 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

An extensive body of data, from meteors, zodiacal light, spacecraft-borne impact detectors (helios, Pioneer, Galileo, and Ulysses), and other sources, forms the basis of a new numerical model for the distributions of interplanetary meteoroids. For each of the five populations in this model it is possible to evaluate meteoroid concentration and flux for oriented surfaces or detectors having arbitrary position and velocity in interplanetary space (Divine, 1992, in preparation). For a spacecraft in geocentric orbit, the effects of gravitational focusing and shielding by the Earth were derived with full attention to the directionality of the particles, both on approach (i.e., relative to a massless Earth) and at the target. This modeling approach was exercised to provide an estimate of meteoroid fluence for each of several oriented surfaces on the Long Duration Exposure Facility (LDEF). Author

N92-27268*# Technical Univ. of Denmark, Lyngby. Physics Lab. 3.
FOLLOW UP ON THE CRYSTAL GROWTH EXPERIMENTS OF THE LDEF Abstract Only **c76**
K. F. Nielsen and M. D. Lind (Rockwell International Science Center, Thousand Oaks, CA.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 59 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The 4 solution growth experiments on the LDEF were presented thoroughly elsewhere. The CaCO3-experiment, and to a certain extent also the TTF-TCNQ-experiments yielded useful results. In Jan. 1992, the next series of solution growth experiments were sent to ESA for shipment to KSC. As on the LDEF, the SGF (solution growth facility) of the EURECA-1 contains 4 large experiments. From the beginning, the planning and developments were introduced. Still, the basic concept was maintained, and the CaCO3-experiment, that showed the best results on the LDEF, will now be repeated with improved technology and in larger scale on the EURECA-1. The contents of the 4 SGF experiments are as follows: (1) growth of calcium-carbonate crystals; (2) formation and transformation of tri-calcium-phosphate; (3) growth of zeolite crystals; and (4) soret coefficient measurements (diffusion). The scientific background for the choice of experiments and the major improvements of the SGF are reviewed. Furthermore, some ideas on basic microgravity solution growth experimentation from ESA's newly established EWG (Expert Working Group) on solution growth are reported. Author

N92-27269*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LDEF MATERIALS OVERVIEW Abstract Only **c23**
Bland A. Stein *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 63 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The flight and retrieval of the LDEF provided an opportunity for the study of the low earth orbit (LEO) environment and long-duration space environmental effects (SEE) on materials that is unparalleled in the history of the US space program. The 5-year, 9-month flight of the LDEF greatly enhanced the potential value of all materials on the LDEF to the international SEE community, compared to that of the original 1-year flight plan. The remarkable flight attitude stability of the LDEF enables specific analyses of various individual and combined effects of LEO environmental parameters on identical materials on the same vehicle. NASA recognized this potential by forming the LDEF Space Environmental Effects on Materials Special Investigation Group (MSIG) to address the greatly expanded materials and LEO space environment parameter analysis opportunities available in the LDEF structure, experiment trays, and corollary measurements, so that the combined value of all LDEF materials data to current and future space missions are addressed and documented. This presentation provides an overview of the interim LDEF materials findings of the principal investigators and the MSIG. Author

N92-27270*# Boeing Co., Seattle, WA. Defense and Space Group.
DATABASES FOR LDEF RESULTS Abstract Only **c82**
Gail Bohnhoff-Hlavacek *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 64 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

One of the objectives of the team supporting the LDEF Systems and Materials Special Investigative Groups is to develop databases of experimental findings. These databases identify the hardware flown, summarize results and conclusions, and provide a system for acknowledging investigators, tracing sources of data, and future design suggestions. To date, databases covering the optical experiments, and thermal control materials (chromic acid anodized aluminum, silverized Teflon blankets, and paints) have been developed at Boeing. We used the Filemaker Pro software, the database manager for the Macintosh computer produced by the Claris Corporation. It is a flat, text-retrievable database that provides access to the data via an intuitive user interface, without tedious programming. Though this software is available only for the Macintosh computer at this time, copies of the databases can be saved to a format that is readable on a personal computer as well. Further, the data can be exported to more powerful relational databases, capabilities, and use of the LDEF databases and describe how to get copies of the database for your own research. Author

N92-27271*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
MATERIALS AND PROCESSES TECHNICAL INFORMATION SYSTEM (MAPTIS) LDEF MATERIALS DATABASE Abstract Only **c82**
John M. Davis and John W. Strickland (BAMSI, Inc., Huntsville, AL.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 65 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Materials and Processes Technical Information System (MAPTIS) is a collection of materials data which was computerized and is available to engineers in the aerospace community involved in the design and development of spacecraft and related hardware. Consisting of various database segments, MAPTIS provides the user with information such as material properties, test data derived from tests specifically conducted for qualification of materials for use in space, verification and control, project management, material information, and various administrative requirements. A recent addition to the project management segment consists of materials data derived from the LDEF flight. This tremendous quantity of data consists of both pre-flight and post-flight data in such diverse areas as optical/thermal, mechanical and electrical properties, atomic concentration surface analysis data, as well as general data such as sample placement on the satellite, A-O flux, equivalent sun hours, etc. Each data point is referenced to the primary investigator(s) and the published paper from which the data was taken. The MAPTIS system is envisioned to become the central location for all LDEF materials data. This paper consists of multiple parts, comprising a general overview of the MAPTIS System and the types of data contained within, and the specific LDEF data element and the data contained in that segment. Author

N92-27272*# Boeing Co., Seattle, WA. Defense and Space Group.
LDEF MATERIALS DATA ANALYSIS: REPRESENTATIVE EXAMPLES Abstract Only **c27**
H. Gary Pippin and E. R. Crutcher *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 66 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Results of measurements on silverized teflon, heat shrink tubing and nylon tie downs on the wire harness clamps, silvered hex nuts, and contamination deposits are presented. We interpret the results in terms of our microenvironments exposure model and locations on the Long Duration Exposure Facility (LDEF). Distinct

changes in the surface properties of FEP were observed as a function of UV exposure. Significant differences in outgassing characteristics were detected for hardware on the interior row 3 relative to identical hardware on the interior row 3 relative to identical hardware on nearby rows. The implications for in service performance are reviewed. Author

N92-27273*# Aerospace Corp., El Segundo, CA.
LONG DURATION EXPOSURE FACILITY EXPERIMENT M0003 DEINTEGRATION OBSERVATION DATABASE Abstract Only **c27**
S. R. Gyetvay, H. K. A. Kan, J. M. Coggi, and M. J. Meshishnek *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 67 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The four trays of the M0003 materials experiment on LDEF contained 1274 samples from 19 subexperiments. The complete sample complement represented a broad range of materials, including thin film optical coatings, paints, polymer sheets and tapes, adhesives, and composites, for use in various spacecraft applications including thermal control, structures, optics, and solar power. Since some subexperiments included duplicate samples exposed on the leading and trailing edge trays, for 9 week, 19 week, 40 week, and 68 month durations on both the leading and trailing edges, comparisons provided a valuable time history of degradation. During the deintegration of the subexperiments from the M0003 trays, each sample was examined using bright field, dark field, and Normarski light microscopy techniques. Over 3,000 color macrographs and photomicrographs were made of the condition of M0003 trays and the individual samples. Records of the condition of the samples, photographic records, and all available references of publications on postflight analyses on each sample were collected in a database. The photographs provide a visual comparison of the response of materials common to various subexperiments in different LDEF environments. Aerospace Corporation is distributing the database records and photographs and written records on materials of interest from the database is given in this presentation. Author

N92-27274*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THERMAL CONTROL SURFACES EXPERIMENT (TCSE) MATERIALS ANALYSIS Abstract Only **c24**
Donald R. Wilkes, Edgar R. Miller (AZ Technology, Huntsville, AL.), James M. Zwiener, and Richard J. Mell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 68 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Materials on the Thermal Control Surfaces Experiment (TCSE) underwent changes in their properties during the 5.8 years of exposure to the combined space environment. The analysis of these materials is continuing and current results are discussed. Some materials were significantly degraded such as silver Teflon, S13GLO, and Z302; while others such as Z93 and YB71 were stable. Time dependent flight data is provided, along with preflight and postflight measurements. Results are compared with other experiments, demonstrating the atomic oxygen (AO) ram effect. Atomic oxygen texturing of silver Teflon varies with incident angle. Even indirect exposure to atomic oxygen appears to be involved with surface texturing on the interior of the TCSE. Localized contamination occurred at discrete locations both inside and on exterior surfaces. Most of the visible deposits were the result of the classical photo-enhanced contamination deposition. The synergism of combined space environmental effects is demonstrated by the specific localization of contamination caused by photo-enhanced deposition versus AO removal. Optical degradation measurements of these contaminated areas, utilizing a new portable reflectometer, are presented. Author

N92-27275*# Aerospace Corp., El Segundo, CA.
THERMAL CONTROL PAINTS ON LDEF: RESULTS OF SUB-EXPERIMENT 802-18 Abstract Only **c27**
Christopher H. Jaggers, M. J. Meshishnek, and J. M. Coggi *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 69 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Several thermal control paints were flown on the LDEF, including the white paints Chemglaze A276, S13GLo, and YB-71, and the black paint D-111. The effects of low earth orbit, which includes UV radiation and atomic oxygen, varied significantly with each paint and its location on LDEF. This paper will examine the performance of these paints as determined by changes in their optical and physical properties, including solar absorptance, surface chemical changes, and changes in surface morphology. It will also provide a correlation of these optical and physical property changes to the physical phenomena that occurred in these materials during the LDEF mission. Author

N92-27276*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LDEF THERMAL CONTROL COATINGS POST-FLIGHT ANALYSIS Abstract Only **c27**
Wayne S. Slemp and Philip R. Young *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 70 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The optical, physical, and chemical properties of selected spacecraft thermal control coatings, exposed for 10 months and 5.8 years on the leading edge (Row 9) of the LDEF, are reported. The following coatings were used: quartz/silver optical solar reflector; silvered FEP Teflon; S-13GLO, YB-71, and A-276 white paints; black paint; and sputter deposited coatings over graphite-epoxy composite substrates. The solar absorptance, total normal emittance, scanning electron and X-ray photoelectron microscopy, and X-ray diffraction analyses will be compared for the control, the 10 month exposed, and the 5.8 year exposed specimens. Data suggests that the high atomic flux over the last 6 months of the LDEF mission may have influenced the results from from this coatings experiment. Author

N92-27277*# Boeing Co., Seattle, WA. Defense and Space Group.
SELECTED RESULTS FOR LDEF THERMAL CONTROL COATINGS Abstract Only **c27**
Johnny L. Golden *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 71 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The investigation of space environmental effects on LDEF thermal control coatings by the Materials Special Investigation Group is continuing. Analyses of chromic acid anodize, A276 white paint, and Z306 black paint were conducted, assessing performance as functions of environmental exposure. Test results from additional coatings, such as on scuff plates, M003, and the black chromium plate solar absorber, were obtained. Guidelines for the use of these materials and comparisons to ground based test data will be presented. Author

N92-27278*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
FLOUORESCENCE MEASUREMENTS OF THE THERMAL CONTROL COATINGS ON LDEF EXPERIMENTS S0069 AND A0114 Abstract Only **c27**
James M. Zwiener, Richard J. Mell, Palmer N. Peters, Donald R. Wilkes, Edgar R. Miller, and John C. Gregory (Alabama Univ., Huntsville.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 72 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Strong fluorescence emissions were observed, during post flight ultraviolet light inspection of experiments S0069 and A0114, from

some of the surfaces exposed to the space environment. Subsequent wavelength measurements of the fluorescence emission characteristics, indicated large changes occurred between controls and exposed materials. Black urethane based coatings, especially ones having a silicone atomic oxygen protective overcoat, appear bright yellow under ultraviolet exposure. Measurements showed that the urethane based coatings had their emission spectra shifted into the visible wavelength range. In contrast, zinc oxide pigment type coatings showed a different effect, which was a quenching or reduction of their fluorescence versus exposure time. Silver Teflon bonded to aluminum with acrylic adhesive also showed a slight measurable fluorescence, which was found to originate in the acrylic adhesive. Author

N92-27279*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ATOMIC OXYGEN EFFECTS ON THERMAL CONTROL AND MIRROR COATINGS: EVALUATION OF EXPERIMENT A0034 Abstract Only **c27**
Roger C. Linton *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 73 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Evaluation of the degradation attributed to contamination of the collector mirrors in Experiment A0034, which were exposed to an earth orbital environment while on the leading and trailing edges of the LDEF, has provided some evidence for outgassing of coatings stimulated by atomic oxygen. Effects of the natural space environment on the coatings and mirrors, including the effects of incident and re-directed atomic oxygen flux, were investigated. The effects of exposure on the coatings and mirrors were evaluated by optical, surface profiling, chemical, and scanning electron microscopy (SEM) measurements. Preliminary results of these analyses are discussed for application to both the issues of mirror and coating stability and the specific issue of atomic oxygen stimulated outgassing. Author

N92-27280*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ATOMIC OXYGEN EFFECTS ON LDEF EXPERIMENT A0171 Abstract Only **c27**
Ann F. Whitaker, Rachel R. Kamenetzky, Miria M. Finckenor, and Joseph K. Norwood *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 74 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Mass and thickness changes measured in thin films, composites, polymers, metals, and paints from LDEF Experiment A0171 are presented. Atomic oxygen accommodation and reactivity numbers along with morphology features are shown for a variety of A0171 materials. The validity of predicting long term erosion rates will be assessed from short term environmental exposures. Author

N92-27281*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MONTE CARLO MODELING OF ATOMIC OXYGEN ATTACK OF POLYMERS WITH PROTECTIVE COATINGS ON LDEF Abstract Only **c27**
Bruce A. Banks, Kim K. deGroh, and Edward A. Sechkar (Cleveland State Univ., OH.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 75 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Characterization of the behavior of atomic oxygen interaction with materials on the Long Duration Exposure Facility (LDEF) will assist in understanding the mechanisms involved, and will lead to improved reliability in predicting in-space durability of materials based on ground laboratory testing. A computational simulation of atomic oxygen interaction with protected polymers was developed using Monte Carlo techniques. Through the use of assumed mechanistic behavior of atomic oxygen and results of both ground laboratory and LDEF data, a predictive Monte Carlo model was developed which simulates the oxidation processes that occur on polymers with applied protective coatings that have defects. The use of high atomic oxygen fluence-directed ram LDEF results has enabled mechanistic implications to be made by adjusting Monte Carlo modeling assumptions to match observed results based on scanning electron microscopy. Modeling assumptions, implications, and predictions are presented, along with comparison of observed ground laboratory and LDEF results. Author

N92-27282*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LDEF POLYMERIC MATERIALS: 10 MONTHS VERSUS 5.8 YEARS OF EXPOSURE Abstract Only **c27**
Philip R. Young, Wayne S. Slemp, and A. C. Chang (Lockheed Engineering and Sciences Co., Hampton, VA.) *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 76 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The chemical characterization of several polymeric materials which received both 10 months and 5.8 years of exposure on a Row 9 experiment (A0134) is reported. Specimens include polysulfone film, polysulfone matrix/graphite-fiber reinforced composites, and coated and uncoated epoxy matrix/graphite fiber reinforced composites. The effect of 10 months of exposure on an experimental silicon-containing polyimide copolymer film is also reported. The results of infrared, thermal, x-ray photoelectron, and scanning electron microscope analyses will be compared for the two exposures. Solution property measurements on the thermoplastic polysulfone resin will also be presented. Molecular level effects attributable to exposure and present in 10-month specimens are not present in 5.8-year specimens. This suggests that increased atomic oxygen fluence toward the end of the mission may have eroded selected environmentally-induced changes in surface chemistry for 5.8-year specimens. Author

N92-27283*# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
THE VISCOELASTIC CHARACTERIZATION OF POLYMER MATERIALS EXPOSED TO THE LOW-EARTH ORBIT ENVIRONMENT Abstract Only **c27**
Thomas Strganac and Alan Letton *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 77 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Recent accomplishments in our research efforts have included the successful measurement of the thermal mechanical properties of polymer materials exposed to the low-earth orbit environment. In particular, viscoelastic properties were recorded using the Rheometrics Solids Analyzer (RSA 2). Dynamic moduli (E', the storage component of the elastic modulus, and E'', the loss component of the elastic modulus) were recorded over three decades of frequency (0.1 to 100 rad/sec) for temperatures ranging from -150 to 150 C. Although this temperature range extends beyond the typical use range of the materials, measurements in this region are necessary in the development of complete viscoelastic constitutive models. The experimental results were used to provide the stress relaxation and creep compliance performance characteristics through viscoelastic correspondence principles. Our results quantify the differences between exposed and control polymer specimens. The characterization is specifically designed to elucidate a constitutive model that accurately predicts the change in behavior of these materials due to exposure. The constitutive model for viscoelastic behavior reflects the level of strain, the rate of strain, and the history of strain as well as the thermal history of the material. Author

N92-27284*# Manchester Univ. (England). Dept. of Geology.
OXYGEN ISOTOPES IMPLANTED IN THE LDEF SPACECRAFT Abstract Only **c72**
J. M. Saxton, I. C. Lyon, E. Chatzitheodoredis, J. D. Gilmour, and G. Turner *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 78 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Depth profiles of O-16 and O-18/O-16 were measured on stainless steel nuts and copper sheet (from a grounding strap) recovered from the leading edge of LDEF (Tray E10). The measurements were obtained by dynamic SIMS (secondary ion mass spectrometry) using a VG Isolab 54 ion microprobe. Plots of O-18/O-16 against time, show large depletions of up to a factor of 2 compared to the O-18/O-16 value at sea level. The O-16 current decreases by 2 orders of magnitude in the interior of the metal, and the corresponding profile of anomalous O-16 is strongly peaked in the outer few tens of nanometers of the surface. This depth scale is a tentative one based on estimated sputtering rates. Plots of O-18/O-16 against 1/O-16 should be linear if two isotopically distinct components, one of variable concentration (orbital component) and one of fixed concentration (normal oxygen), are mixed. Data to be presented at the meeting show departures from linearity which result from variability in the concentration of normal oxygen, but may also arise from the implantation of oxygen with a range of fractionation due to the decaying orbit of the LDEF, sputtering of the surface by atomic oxygen, and the different momenta of the two isotopes due to their equal velocities. The potential for using this method as a means of identifying exposure to low-Earth orbit, de-convoluting the effects of space exposure from terrestrial contamination, and using the implanted anomolous oxygen as a means of studying the atomic oxygen density and upper atmosphere temperature height profile will be discussed at the meeting. Author

N92-27285*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SILAZANE TO SILICA Abstract Only **c27**
Gale A. Harvey *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 79 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Thin film silica and/or methyl silicone were detected on most external surfaces of the retrieved LDEF. Known sources of silicone in or on the LDEF appear inadequate to explain the ubiquitous presence of the silica and silicone films. Hexamethyldisilazane (HMDS) was used as the Challenger tile waterproofing compound for the Challenger/LDEF deployment mission. HMDS releases NH3 which depolymerizes silicone RTV's. Polyurethanes were also attacked. Much of the silica/silicone contamination of LDEF resulted from HMDS. Author

N92-27286*# LeTourneau Coll., Longview, TX.
STABILITY AND REACTIVITY OF DIMETHYLETHOXYSILANE Abstract Only **c25**
Richard E. Johnson and Douglas I. Ford *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 80 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Dimethylethoxysilane (DMES) is currently used to treat the High-temperature Reusable Surface Insulation (HRSI) shuttle tiles in order to provide a hydrophobic surface on the silica. DMES is a volatile, reactive silane that incorporates two reactive sites, the ethoxy group and the silica-hydride group. The work reported in this paper focused on the reactivity of these two groups with silica, water, quantitative reagents, and within DMES itself.
Author

N92-27287*# Queensland Univ., Brisbane (Australia). Polymer Materials and Radiation Group.
AN ESR STUDY OF THE UV DEGRADATION OF FEP Abstract Only **c27**
G. A. George, D. J. T. Hill, J. H. ODonnell, P. J. Pomery, and F. Rasoul *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 81 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Spacecraft in low earth orbit are subjected to significant levels of high energy radiation, including ultraviolet (UV) and visible ultraviolet (VUV) wavelengths. The effects of UV radiation are enhanced over those at the surface of the earth, where the only incident wavelengths are greater than 290 nm. In low earth orbit the incident UV wavelengths extend below 290 nm into the VUV region, where the Lyman alpha-emissions of atomic hydrogen occur at 121 nm. In addition to electromagnetic radiation, in low earth orbit polymer materials may also be subjected to atomic oxygen particle radiation, which will result in direct oxidation of the polymer. Author

N92-27288*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
LDEF RESULTS FOR POLYMER MATRIX COMPOSITE EXPERIMENT AO 180 Abstract Only **c27**
R. C. Tennyson *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 82 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

This report represents a summary of the results obtained to-date on a polymer matrix composite experiment (AO 180) located at station D-12, about 82 deg off the 'ram' direction. Different material systems comprised of graphite, boron, and aramid (Kevlar) fiber reinforcements were studied. Although previous results were presented on in-situ thermal-vacuum cycling effects, particularly dimensional changes associated with outgassing, additional comparative data will be shown from ground-based tests on control and flight samples. The system employed was fully automated for thermal-vacuum cycling using a laser interferometer for monitoring displacements. Erosion of all three classes of materials due to atomic oxygen (AO) will also be discussed, including angle of incidence effects. Data from this experiment will be compared to published results for similar materials in other LDEF experiments. Composite materials' erosion yields will be presented on an AO design nomogram useful for estimating total material loss for given exposure conditions in low Earth orbit (LEO). Optical properties of these materials will also be compared with control samples. A survey of the damage caused by micrometeoroids/debris impacts will be addressed as they relate to polymer matrix composites. Correlations between hole size and damage pattern will be given. Reference to a new nomogram for estimating the number distribution of micrometeoroid/debris impacts for a given space structure as a function of time in LEO will be addressed based on LDEF data. Author

N92-27289*# Michigan Univ., Ann Arbor.
HIGH-TOUGHNESS GRAPHITE/EPOXY COMPOSITE MATERIAL EXPERIMENT Abstract Only **c24**
David K. Felbeck *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 83 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

This LDEF experiment was designed to measure the effects of near-earth exposure on graphite/epoxy composites over a range of properties. All of the specimens were 8 plies thick, with one of two different cross-ply angles and with one of four different values of bonding fraction between plies. The mechanical properties of interest are toughness, strength, and elastic modulus. Six toughness specimens and nine strength/modulus specimens were manufactured and flown. Author

N92-27290*# Boeing Co., Seattle, WA. Defense and Space Group.
SPACE ENVIRONMENTAL EFFECTS ON LDEF COMPOSITES: LEADING GRAPHITE/EPOXY PANEL, SELECTED TRAILING EDGE SPECIMENS Abstract Only **c24**
Harry Dursch, Pete George, and Sylvester Hill *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 84 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The composite electronics-module cover for the leading edge (row D9) experiment M0003-8 was fabricated from T300 graphite/934 epoxy unidirectional prepreg tape in a multi-oriented layup. This panel contained thermal control coatings in three of

the four quadrants with the fourth quadrant left uncoated as a control. The composite experienced different thermal cycling extremes in each quadrant due to the differing optical properties of the coatings. Results will be presented on microcracking and other Low Earth Orbital (LEO) effects on the coated panel substrate. Author

N92-27291*# Rockwell International Corp., Tulsa, OK.
EVALUATION OF LONG-DURATION EXPOSURE TO THE NATURAL SPACE ENVIRONMENT ON THE MECHANICAL PROPERTIES OF CARBON-REINFORCED EPOXY AND POLYIMIDE COMPOSITES Abstract Only **c24**
Richard F. Vyhnal, Douglas W. Welch, and J. Howard Powell *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 85 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Experiment AO175 involved passive exposure of carbon-fiber reinforced laminates of epoxy, bismaleimide, and polyimide resins. The post-flight evaluation includes the following: optical examination of exposed surfaces and polished cross-sections; panel weight and distortion measurements; ultrasonic c-scan inspection; and conventional mechanical testing of coupons machined from the panels. Author

N92-27292*# Grumman Aerospace Corp., Bethpage, NY.
EFFECTS OF THE LOW EARTH ORBIT SPACE ENVIRONMENT ON THE SURFACE CHEMISTRY OF KAPTON POLYIMIDE FILM: AN XPS STUDY Abstract Only **c27**
Myung Lee, William Rooney, and James Whiteside *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 86 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Kapton H (DuPont Trademark) polyimide specimens exposed to the low earth (LEO) space environment suffered significant weathering with surface erosions of approximately 8.0 microns. Despite these effects, no significant changes in bulk chemistry were observed. X-ray photoelectron spectroscopy (XPS) was used to determine local changes induced from approximately 25 percent in 1980 vintage ground control specimens to nearly 53 percent in space exposed specimens. The greatest increase was observed for the divalent oxygen moieties, although a slight increase in carbonyl oxygen was also measured. Furthermore, the chemical shifts of all XPS peaks of space-exposed Kapton are shifted to higher energy. This is consistent with a higher oxidation state of the space exposed surface. Finally, space exposed specimens had distinct silicon peaks (2p 100 eV and 2s 149 eV) in their XPS spectra in agreement with widespread reports of silicon contamination throughout the LDEF satellite. These results are discussed in terms of surface reactivity of the polyimide exposed to the LEO environment and the chemical nature of contaminants deposited on flight surfaces due to satellite outgassing. Author

N92-27293*# Aerospace Corp., El Segundo, CA.
SURFACE ANALYSES OF COMPOSITES EXPOSED TO THE SPACE ENVIRONMENT ON LDEF Abstract Only **c24**
Joseph J. Mallon, Joseph C. Uht, and Carol S. Hemminger *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 87 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

We have conducted a series of surface analyses on carbon fiber/polyarylacetylene matrix composites that were exposed to the space environment on the LDEF satellite. None of the composites were catastrophically damaged by nearly six years of exposure to the space environment. Composites on the leading edge exhibited about 5 mils of surface erosion, but trailing edge panels exhibited no physical appearance changes due to exposure. Scanning electron microscopy (SEM) was used to show that the erosion morphology on the leading edge samples was dominated by crevasses parallel to the fibers with triangular cross sections 10 to 100 microns in depth. The edges of the crevasses were well defined and penetrated through both matrix and fiber. The data suggest that the carbon fibers are playing a significant role in crevasse initiation and/or enlargement, and in the overall erosion rate of the composite. X-ray photoelectron spectroscopy (XPS) and energy dispersive X-ray spectroscopy (EDS) results showed the presence of silicone and hydrocarbon contamination from in-flight sources. The role of contamination in crevasse initiation and enlargement is unknown at this time. These LDEF results demonstrate that the prediction of long term atomic oxygen erosion morphology for composite materials from erosion data obtained on short Space Shuttle missions is difficult. A better understanding of other factors such as thermal cycling and UV exposure which may influence erosion is necessary to improve the accuracy of the predictions. Author

N92-27294*# Aerospace Corp., Los Angeles, CA. Composites Section.
THERMAL EXPANSION BEHAVIOR OF LDEF METAL MATRIX COMPOSITES Abstract Only **c24**
T. D. Le and G. L. Steckel *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 88 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The effects of the space environment on the thermal expansion stability of metal matrix composites (graphite/Al and graphite/Mg) will be presented. A sample from each category of metal matrix composites mounted on the leading and trailing edge was chosen for analysis of the temperature-time-thermal strain histories. Typical thermal expansion curves over the same range of temperature were selected at the beginning, mid, and end of the recording duration. The thermal expansion of selected post-flight LDEF samples were measured over the same range of temperature in the laboratory using a Michelson laser interferometer. The thermal strains were monitored concurrently with a laser interferometer and a mounted strain gage. Author

N92-27295*# Calspan Corp., Arnold AFS, TN.
SPECTRAL INFRARED HEMISPHERICAL REFLECTANCE MEASUREMENTS FOR LDEF TRAY CLAMPS Abstract Only **c74**
Bobby E. Wood, Brian K. Cromwell, Charles W. Pender, and Seth D. Shepherd (Air Force Systems Command, Arnold AFS, TN.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 89 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

This paper describes infrared hemispherical reflectance measurements (2-15 microns) that were made on 58 chromic acid anodized tray clamps retrieved from the LDEF spacecraft. These clamps were used for maintaining the experiments in place and were located at various locations about the spacecraft. Changes in reflectance of the tray clamps at these locations were compared with atomic oxygen fluxes at the same locations. A decrease in absorption band depth was seen for the surfaces exposed to space indicating that there was some surface layer erosion. In all of the surfaces measured, little evidence of contamination was observed and none of the samples showed evidence of the brown nicotine stain that was so prominent in other experiments. Total emissivity values were calculated for both exposed and unexposed tray clamp surfaces. Only small differences, usually less than 1 percent, were observed. The spectral reflectances were measured using a hemi-ellipsoidal mirror reflectometer matched with an interferometer spectrometer. The rapid scanning capability of the interferometer allowed the reflectance measurements to be made in a timely fashion. The ellipsoidal mirror has its two foci separated by 2 inches and located on the major axis. A blackbody source was located at one focus while the tray clamp samples were located at the conjugate focus. The blackbody radiation was modulated and then focused by the ellipsoid onto the tray clamps. Radiation reflected from the tray clamp was sampled by the interferometer by viewing through a hole in the ellipsoid. A gold mirror (reflectance approximately 98 percent) was used as the reference surface. Author

N92-27296*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SURFACE ANALYSIS OF ANODIZED ALUMINUM CLAMPS FROM NASA-LDEF SATELLITE Abstract Only **c26**
H. L. Grammer, J. P. Wightman (Virginia Polytechnic Inst. and State Univ., Blacksburg.), and Philip R. Young *In its* Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 90 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Surface analysis results of selected anodized aluminum clamps containing black (Z306) and white (A276) paints which received nearly six years of Low Earth Orbit (LEO) exposure on the Long Duration Exposure Facility are reported. Surface analytical techniques, including x-ray photoelectron spectroscopy (XPS), Auger electron spectroscopy (AES), and scanning electron microscopy/energy dispersive analysis by x-ray (SEM/EDAX), showed significant differences in the surface composition of these materials depending upon the position on the LDEF. Differences in the surface composition are attributed to varying amounts of atomic oxygen and vacuum ultraviolet radiation (VUV). Silicon containing compounds were the primary contaminant detected on the materials. Author

N92-27297*# Boeing Co., Seattle, WA. Defence and Space Group.
CONTAMINATION ON LDEF SOURCES: DISTRIBUTION AND HISTORY Abstract Only **c25**
H. Gary Pippin and E. R. Crutcher *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 91 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

An overview description of contamination sources from preflight, mission, and post flight environments is presented. Examples of contamination events and processes from each stage of the LDEF mission are given. Infrared (IR) and x-ray photoelectron spectroscopy (XPS) data characterizing some of the contaminant films will be shown. Property changes on surfaces due to contaminant films, and post-deposition changes in the contaminant films due to the space environment will be reported. Author

N92-27298*# Aerospace Corp., El Segundo, CA.
CONTAMINATION MEASUREMENTS ON EXPERIMENT M0003 Abstract Only **c25**
Eugene N. Borson and F. Barry Sinsheimer *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 92 (For primary document see N92-27218 18-99)
(Contract F04701-88-C-0089)
Avail: NTIS HC/MF A07

The contamination monitors on the M0003 experiment consisted of passive sample collectors to measure molecular and particular deposition. The collectors were placed in the leading and trailing edge trays of M0003. The objective was to quantify the contaminants and determine how contamination affected the other materials in the trays. Duplicate collectors were placed inside the vacuum canisters that provided protection from the launch, ascent, deployment, and recovery environments. Author

N92-27299*# Boeing Co., Seattle, WA. Defense and Space Group.
EVALUATION OF SEALS, LUBRICANTS, AND ADHESIVES USED ON LDEF Abstract Only **c37**
H. Gary Pippin, Bruce Keough, and Harry Dursch *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 93 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

A wide variety of seals, lubricants, and adhesives were used on LDEF. This paper will discuss the ongoing Materials Special Investigations Group investigation into the effect of the long term exposure of these various materials to the Low Earth Orbit (LEO) environment. This investigation includes the testing of hardware at Boeing, documenting and collating experimenter test results, and deriving 'lessons learned.' Author

N92-27300*# Centre National d'Etudes Spatiales, Toulouse (France).
SPACECRAFT THERMAL CONTROL COATINGS: COMPARISON BETWEEN FLIGHT RESULTS OBTAINED ON LDEF AND MIR Abstract Only **c27**
Jean-Claude Guillaumon and A. Paillous (Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse, France) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 94 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The COMES experiment was installed outside of the MIR space station during an extravehicular activity. The experiment was exposed to vacuum, atomic oxygen, and ultraviolet radiation (UV) for 1.1 years. Due to a lack of knowledge about the spacecrafts actual attitude, there is a large uncertainty in the atomic oxygen fluence and the UV dose that was experienced by COMES. Additionally, contaminants of many different origins were observed on the COMES samples. Author

N92-27301*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ANGULAR DISTRIBUTIONS OF 5eV ATOMIC OXYGEN SCATTERED FROM SOLID SURFACES ON THE LDEF SATELLITE Abstract Only **c72**
John C. Gregory (Alabama Univ., Huntsville.) and Palmer N. Peters *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 95 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The angular distribution of 5eV atomic oxygen scattered off several smooth solid surfaces was measured by experiment A0114 which flew on board the Long Duration Exposure Facility (LDEF). Target surfaces were silver, vitreous carbon, and lithium fluoride crystal. The apparatus was entirely passive. It used the property of silver surfaces to absorb oxygen atoms with high efficiency; the silver is converted to optically transmissive silver oxide. A collimated beam of oxygen atoms is allowed to fall on the target surface at some pre-set angle. Reflected atoms are then intercepted by a silver film placed so that it subtends a considerable solid angle from the primary beam impact on the target surface. The silver films are evaporated onto flexible optically-clear polycarbonate sheets which are scanned later to determine oxygen uptake. While the silver detector cannot measure atom velocity or energy, its physical configuration allows easy coverage of large angular space both in the beam-plane (that which includes the incident beam and the surface normal), and in the azimuthal plane of the target surface. Author

N92-27302*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
INTERACTION OF ATOMIC OXYGEN WITH THIN FILM AND BULK COPPER: AN XPS, AES, XRD, AND PROFILOMETER STUDY Abstract Only **c72**
Genesh N. Raikar, John C. Gregory, Ligia C. Christl (Alabama Univ., Huntsville.), and Palmer N. Peters *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 96 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The University of Alabama in Huntsville (UAH) experiment A-0114 was designed primarily to study degradation of material surfaces due to low earth orbital (LEO) atmospheric oxygen. The experiment contained 128 one inch circular samples: metals, polymers, carbons, and semiconductors. Among metal samples, copper has shown some interesting new results. Two types of copper samples, a film sputter coated on fused silica and a bulk piece of OFHC copper, were characterized employing a variety of techniques such as X-ray and Auger electron spectroscopies, X-ray diffraction, and high resolution profilometry. Cu 2p core level spectra

were used to characterize the presence of Cu2O and CuO in addition to Cu Auger LMM lines. These results are supported by our recent X-ray diffraction studies which clearly establish the presence of Cu oxides which we were unable to prove in our earlier work. Profilometry showed an increase in thickness of the film sample where exposed to 106.7 +/- 0.5 nm from an initial thickness of 74.2 +/- 1.1 nm. Further studies with SEM and ellipsometry are underway. Author

N92-27303*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
OVERVIEW OF THE SYSTEMS SPECIAL INVESTIGATION Abstract Only **c27**
James B. Mason, Harry Dursch, and Joel Edelman (Long Duration Exposure Facility Newsletter, Silver Spring, MD.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 99 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Systems Special Investigation Group (SIG), formed by the Long Duration Exposure Facility (LDEF) Project Office to perform post flight analysis of systems hardware, was chartered to investigate the effects of the extended LDEF mission on both satellite and experiment systems and to coordinate and integrate all systems analysis performed in post flight investigations. Almost all of the top level functional testing of the active experiments has been completed, but many components are still under investigation by either the Systems SIG or individual experimenters. Results reported to date have been collected and integrated by the Systems SIG and an overview of the current results and the status of the Systems Investigation are presented in this paper. Author

N92-27304*# Centre National d'Etudes Spatiales, Toulouse (France).
NEW RESULTS FROM FRECOPA ANALYSIS Abstract Only **c37**
Christian Durin *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 100 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Given Long Duration Exposure Facility (LDEF) new situation (5.8 years mission), CNES decided to set up a team to analyze FRECOPA systems (AO 138). We studied the kinematic system first. We observed damage on the DELRIN gears and lubricant ageing. The results are based on comparative appraisals between components after flight and those stored on ground in laboratory conditions. We observed also the aluminum surface treatment in the exposed areas and we measured the thermo-optical properties changes. Now, with all the results stored, we try to give a ruling on the use of FRECOPA materials in space environment. Author

N92-27305*# Boeing Co., Seattle, WA. Defense and Space Group.
MECHANISMS FLOWN ON LDEF Abstract Only **c37**
Harry Dursch and Steve Spear *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 101 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

A wide variety of mechanisms were flown on the Long Duration Exposure Facility (LDEF). These include canisters, valves, gears, drive train assemblies, and motors. This report will provide the status of the Systems SIG effort into documenting, integrating, and developing 'lessons learned' for the variety of mechanisms flown on the LDEF. Results will include both testing data developed by the various experimenters and data acquired by testing of hardware at Boeing. Author

N92-27306*# Georgia Tech Research Inst., Atlanta.
DEGRADATION OF ELECTRO-OPTIC COMPONENTS ABOARD LDEF Abstract Only **c74**
M. D. Blue *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 102 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Re-measurement of the properties of a set of electro-optic components exposed to the low earth orbital environment aboard the Long Duration Exposure Facility (LDEF) indicates that most components survived quite well. Typical components showed some effects related to the space environment unless well protected. The effects were often small but significant. Results for semiconductor infrared detectors, lasers, LED's, filter, mirrors, and black paints will be presented. Semiconductor detectors and emitters were scarred but reproduced their original characteristics. Spectral characteristics of multi-layer dielectric filters and mirrors were found to be altered and degraded. Increased absorption in black paints indicates an increase in absorption sites, giving rise to enhanced performance as coatings for baffles and sunscreens. We find plastics and multi-layer dielectric coatings to be potentially unstable. Semiconductor devices, metal, and glass are more likely to be stable. Author

N92-27307*# Phillips Lab., Kirkland AFB, NM.
DEGRADATION OF OPTICAL COMPONENTS IN A SPACE ENVIRONMENT Abstract Only **c74**
Linda L. DeHainaut, John Kenemuth, Cynthia E. Tidler, and David W. Seegmiller (Schafer, W. J. Associates, Inc., Albuquerque, NM) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 103 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The objective of the Phillips Laboratory (PL) Long Duration Exposure Facility (LDEF) experiment is to determine the adverse effects of the natural space environment on laser optical component and coating materials. The LDEF experiment provides a unique opportunity for the study of optical material response to an extended low earth orbit space exposure. The PL samples consist of 10 sets of the six materials each. The materials are uncoated fused silica, magnesium fluoride coated fused silica, uncoated molybdenum, molybdenum coated with chromium, silver and thorium fluoride, diamond turned copper, and diamond turned nickel plated copper. Performance degradation will be correlated to establish trends between sample location, duration of exposure, atomic oxygen exposure and other space environmental conditions. This paper discusses the results of the tests thus far performed on the LDEF samples and the plans for the future. Author

N92-27308*# TRW Space and Defense Sector, Redondo Beach, CA.
OPTICAL CHARACTERIZATION OF CONTAMINANT FILM Abstract Only **c74**
Brian K. Blakkolb, James Y. Yaung, Tom Kosic, and Howard Bowen (Hughes Aircraft Co., El Segundo, CA.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 104 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The so called 'nicotine stain' documented at many locations on the Long Duration Exposure Facility is still unexplained as to the exact origin and mechanism of deposition, although enough is known to have some understanding of the conditions coincident for the formation of the deposits. Direct and scattered atomic oxygen flux, and solar ultraviolet radiation interacting with materials outgassing products have all been implicated in the formation of the dark brown contamination deposits. The nicotine stain represents a potential of performance degradation for spacecraft designed for long term operation in low Earth orbit and therefore, a need exists to characterize this form of spacecraft self contamination and quantify the impact on thermal/optical systems. Optical property measurements in the spectral range of 2 to 10 microns were performed on specimens of the contaminated film. Reflectance measurements of the contaminant film as deposited on the surface and as free standing films are presented along with transmission spectra for the bulk material. Thickness measurements along with micrographic examination of the cross

section of the deposit reveal the layered structure of the deposit which further implicates solar illumination as a factor in the deposition mechanism. Author

N92-27309*# Paris XI Univ., Orsay (France). Inst. d'Astrophysique Spatiale.
IN ORBIT DEGRADATION OF UV OPTICAL COMPONENTS FOR THE WAVELENGTH RANGE 10-140 MICRONS. AO 138.3 (FRECOPA) Abstract Only **c74**
J. P. Delabouinere, C. Carabetian, and J. F. Hochedez *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 105 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Optical components (thin film filters and multilayered mirrors) for use in the wavelength range 10-140 micro-m were included in the vacuum tight container FRECOPA in preparation for the SOHO mission. They were exposed during 9 months at the beginning of the Long Duration Exposure Facility (LDEF) flight. One batch of components was exposed to the sun, while another one was shielded from solar radiation. The results of the optical transmission measurements of the flight components and of a groundbase reference set, made at the ORSAY Synchotron radiation light source are presented. Author

N92-27310*# Eastman Kodak Co., Rochester, NY.
EFFECTS OF LONG TERM SPACE ENVIRONMENT EXPOSURE ON OPTICAL SUBSTRATES AND COATINGS (S0050-2) Abstract Only **c74**
John Vallimont and Arthur Mustico *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 107 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The experiment consisted of Fused Silica and Ultra Low Expansion (ULE(tm)) glass samples which were either uncoated or had high reflectance silver, antireflectance, or solar rejection coatings. A set of duplicate control samples was manufactured and stored in a controlled environment for comparison purposes. We will present spectral curves for the glass and coatings which define preflight, postflight, and post-cleaning performance. Data on the analysis of the contaminate deposited on the samples and stress measurements in the glass will also be presented. Some results of particular interest are that the contaminate composition varied between different types of samples, and no darkening of the ULE(tm) glass occurred due to the radiation exposure. Author

N92-27311*# Science Applications International Corp., Santa Monica, CA.
LDEF SPACE OPTICS HANDBOOK Abstract Only **c74**
Robert J. Champetier, Dale R. Atkinson, and William T. Kemp (Phillips Lab., Kirkland AFB, NM.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 108 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

There is a need to present design guidelines derived from the Long Duration Exposure Facility (LDEF) space optics experiments to hardware designers. In response to this need, a small study program has been started. The objective is to prepare a top level review of available results on the behavior of certain optical components in the LDEF space experiments. The optics interest centers on optical surfaces and coatings, and fabrication processes for laser windows and mirrors. The program has two main parts: the first phase, consists of identifying and acquiring data from appropriate investigators. The second phase, comprises report preparation as well as selected, prioritized, additional characterization of certain samples, coordinated with the principal investigators. This short paper outlines the program under way. Author

N92-27312*# Jobin et Yvon S.A., Longjumeau (France).
RULED AND HOLOGRAPHIC EXPERIMENT (AO 138-5) Abstract Only **c35**
Francis Bonnemason *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 109 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The AO 138-5 experiment has been designed, via the French Cooperative Payload (FRECOPA) experiment with the aim to study the optical behavior of different diffraction gratings submitted to space vacuum long exposure and solar radiation. Samples were rules and holographic gratings, masters or replica, and some additional control mirrors with various coatings. The experiment was located on the B3, trailing edge of the Long Duration Exposure Facility (LDEF) and has been protected against atomic oxygen flux. The experienced thermal cycling has been evaluated from -23 C to 66 C during the flight, 34,000 orbits. The analysis has been focused on the triple point characterization including light efficiency, wavefront flatness quality and stray light level. Tests were conducted on control mirrors and gratings loaded but not exposed to cosmic dust or solar irradiations. They did not show any significant variations. Solar exposure has damaged the coating reflectivity in the ultraviolet region, the degradation is higher with the gratings, in terms of efficiency. However, wavefront flatness quality and stray light level tests revealed no additional changes. Author

N92-27313*# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
HOLOGRAPHIC DATA STORAGE CRYSTALS FOR THE LDEF Abstract Only **c76**
W. Russell Callen and Thomas K. Gaylord *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 110 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Lithium niobate is a significant electro-optic material, with potential applications in ultra high capacity storage and processing systems. Lithium niobate is the material of choice for many integrated optical devices and holographic mass memory systems. For crystals of lithium niobate were passively exposed to the space environment of the Long Duration Exposure Facility (LDEF). Three of these crystals contained volume holograms. Although the crystals suffered the surface damage characteristics of most of the other optical components on the Georgia Tech tray, the crystals were recovered intact. The holograms were severely degraded because of the lengthy exposure, but the bulk properties are being investigated to determine the spaceworthiness for space data storage and retrieval systems. Author

N92-27314*# Phillips Lab., Kirkland AFB, NM. Space and Missiles Directorate.
CHARACTERIZATION OF A SPACE ORBITED INCOHERENT FIBER OPTIC BUNDLE Abstract Only **c74**
S. A. DeWalt and E. W. Taylor *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 111 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The purpose of this paper is to report the results of a study performed to determine the effects of adverse space environments on a bundle of 1800+ optical fibers space orbited for 69 months. Experimental results are presented on an incoherent fiber optic bundle oriented in low earth orbit aboard the Long Duration Exposure Facility (LDEF) satellite as part of the Space Environment Effects Experiments (M0006). Measurements were performed to determine if space induced radiation effects changed the bundle characteristics. Data demonstrating the success of this light transmitting fiber optical bundle to withstand the adverse space environment are presented. Author

N92-27315*# Phillips Lab., Kirkland AFB, NM. Space and Missiles Technology Directorate.
ANALYSIS OF SPACE ENVIRONMENT EFFECTS ON ACTIVE FIBER OPTIC LINKS ORBITED ABOARD THE LDEF Abstract Only **c74**
T. W. Monarski, J. N. Berry, A. D. Sanchez, R. J. Padden, S. P.

Chapman, and E. W. Taylor *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 112 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The interim analysis correlates the results of the 'Preliminary Analysis of WL Experiment no. 701, Space Environment Effects on Operating Optic Systems' (NASA Report CP-3134) with space simulated post retrieval terrestrial studies performed on the M0004 experiment. Temperature cycling measurements were performed on the active optical data links for the purpose of assessing link signal to noise ratio and bit error rate performance some 69 months following the experiment deployment in low earth orbit. The early results indicate a high correlation between pre-orbit, orbit recorded, and post orbit functionality of the first known and longest space demonstration of operating optic fibers. Author

N92-27316*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIATION AND TEMPERATURE EFFECTS ON LDEF FIBER OPTIC CABLE SAMPLES Abstract Only **c74**
Alan R. Johnston, Ron Hartmayer, and Larry A. Bergman *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 113 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

This paper will concentrate on results obtained from the Jet Propulsion Lab (JPL) Fiber Optics Long Duration Exposure Facility (LDEF) Experiment since the June 1991 Experimenters Workshop. Radiation darkening of the laboratory control samples will be compared with the LDEF flight samples. The results of laboratory temperature tests on the flight samples extending over a period of about nine years including the preflight and postflight analysis periods will be described. Author

N92-27317*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
LONG DURATION EXPOSURE FACILITY (LDEF) LOW-TEMPERATURE HEAT PIPE EXPERIMENT PACKAGE (HEPP) FLIGHT RESULTS Abstract Only **c34**
Roy McIntosh, Craig McCreight, and Patrick J. Brennan (OAO Corp., Greenbelt, MD.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 114 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Low Temperature Heat Pipe Flight Experiment (HEPP) is a fairly complicated thermal control experiment that was designed to evaluate the performance of two different low temperature ethane heat pipes and a n-Heptane Phase Change Material (PCM) canister. A total of 388 days of continuous operation with an axially grooved aluminum fixed conductance heat pipe of axially grooved stainless steel heat pipe diode was demonstrated before the EDS batteries lost power. The inability of the HEPP's radiator to cool below 190 K in flight prevented freezing of the PCM and the opportunity to conduct transport tests with the heat pipes. Post flight tests showed that the heat pipes and the PCM are still functioning. This paper presents a summary of the flight data analysis for the HEPP and its related support systems. Pre and post-flight thermal vacuum tests results are presented for the HEPP thermal control system along with individual heat pipe performance and PCM behavior. Appropriate SIG related systems data will also be included along with a 'lessons learned' summary. Author

N92-27318*# Aerospace Corp., El Segundo, CA.
POST-FLIGHT ANALYSES OF THE CRYSTALS FROM THE M0003-14 QUARTZ CRYSTAL MICROBALANCE EXPERIMENT Abstract Only **c76**
W. K. Stuckey, G. Radhakrishnan, and D. Wallace (QCM Research, Laguna Beach, CA.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 115 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Quartz Crystal Microbalances constructed by QCM Research were flown on the leading and trailing edges of the Long Duration Exposure Facility (LDEF) as one of the sub-experiments of M0003. Response of the crystals coated with 150 A of IN2O3ZnS was recorded during the first 424 days of the mission. A second QCM with crystals coated with 150 A was also flown but not monitored. The flight data and temperature profiles will be presented. After the flight, the QCM's were disassembled and analyzed. The samples included the crystals from the leading and trailing edge samples of both types of coatings along with the reference crystals which were inside the QCM housing. Analyses were performed by scanning electron microscopy, energy dispersive x ray analysis, x ray photoelectron spectroscopy, ion microprobe mass analysis, and reflectance spectroscopy in the infrared and ultraviolet/visible region. The crystals were contaminated predominantly with silicone compounds. The contamination is higher on the leading edge than on the trailing edge, and higher on the exposed crystal than on the reference crystals. No significant differences in composition of the In2O3 crystals were noted. Differences in the reflectance and surface analysis of the Zns crystals will be discussed. Author

N92-27319*# Martin Marietta Corp., Baltimore, MD.
STUDY OF FACTORS DETERMINING THE RADIATION SENSITIVITY OF QUARTZ CRYSTAL OSCILLATORS (A0189) Abstract Only **c76**
J. S. Ahearn and J. D. Venables *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 116 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Previous postflight tests of quartz resonators fabricated from swept premium Q quartz were affected by the space radiation environment experienced on the Long Duration Exposure Facility (LDEF) flight. Resonators fabricated from natural quartz materials were not. The resonant frequency of the swept premium Q material exposed to the space radiation exhibited a change in frequency that was significantly larger than that of the controls or the natural crystal material and the frequency change was attributed to a recovery of damage to the quartz material sustained during the LDEF flight. Further tests of the resonators, currently in progress, are being conducted to verify this conclusion, the results of which will be presented at the LDEF Symposium. Author

N92-27320*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE EFFECT OF THE LOW EARTH ORBIT ENVIRONMENT ON SPACE SOLAR CELLS: RESULTS OF THE ADVANCED PHOTOVOLTAIC EXPERIMENT (S0014) Abstract Only **c44**
David J. Brinker and John R. Hickey (Eppley Lab., Inc., Newport, RI.) *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 117 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Advanced Photovoltaic Experiment (APEX), containing over 150 solar cells and sensors, was designed to generate laboratory reference standards as well as to explore the durability of a wide variety of space solar cells. Located on the leading edge of the Long Duration Exposure Facility (LDEF), APEX received the maximum possible dosage of atomic oxygen and ultraviolet radiation, as well as enormous numbers of impacts from micrometeoroids and debris. The effect of the low earth orbital (LEO) environment on the solar cells and materials of APEX will be discussed in this paper. The on-orbit performance of the solar cells, as well as a comparison of pre- and postflight laboratory performance measurements, will be presented. Author

N92-27321*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LEO EFFECTS ON CANDIDATE SOLAR CELL COVER MATERIALS Abstract Only **c44**
Paul M. Stella *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 118 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Long Duration Exposure Facility (LDEF) test samples

discussed within are part of the Solar Array Materials Passive (SAMPLE) LDEF experiment, which included contributions from NASA and Jet Propulsion Lab (JPL). Only the JPL portion is described in this paper. The JPL test plate contains 30 individual thin silicon solar cell/cover samples. It was the intent of the experiment to evaluate the stability and protective capability of various cover materials such as conventional fused silica and potential alternative materials such as Teflon, silicone RTV's, glass resins, polyimides, and a copolymer encapsulate. Examination of the recovered experiment shows extensive physical changes have occurred. Approximately 150 micrometeoroid/debris impact were noted, some directly on the solar cells. Of particular interest are the results of ultraviolet and atomic oxygen interactions with the various cover materials. Initial results show that the fused silica cover is the most stable and protective, with performance of other materials varying widely. Electrical measurements of the cell/cover samples are presented as part of the evaluation of cover materials to protect cells in low earth orbit environments. Author

N92-27322*# Oklahoma State Univ., Stillwater.
FINAL RESULTS OF THE SPACE EXPOSED EXPERIMENT DEVELOPED FOR STUDENTS (SEEDS) P-0004-2 Abstract Only **c51**
Doris K. Grigsby *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 121 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Space Exposed Experiment Developed for Students (SEEDS), resulted in the distribution of over 132,000 SEED kits in 1990. The kits contained Rutger's tomato seeds that had flown on the Long Duration Exposure Facility (LDEF) as well as seeds that had been stored in a climate controlled warehouse for the same period of time. Students compared germination and growth rate characteristics of the two seeds groups and returned data to NASA for analysis. The scientific information gained was valuable as students shared the excitement of taking part in a national project. Of greater importance was the subsequent interest generated in science education. Author

N92-27323*# Park Seed Co., Inc., Greenwood, SC.
CONTINUED RESULTS OF THE SEEDS IN SPACE EXPERIMENT Abstract Only **c51**
Jim A. Alston *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 122 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Two million seeds of 120 different varieties representing 106 species, 97 genera, and 55 plant families were flown aboard the Long Duration Exposure Facility (LDEF). The seeds were housed on the Space Exposed Experiment Developed for Students (SEEDS) tray in the sealed canister number 6 and in two small vented canisters. The seeds were germinated and the germination rates and development of the resulting plants compared to the control seed that stayed in the storage facility. There was a better survival rate in the sealed canister in space than in the storage facility. At least some of the seed in the vented canisters survived the exposure to vacuum for almost six years. The number of observed mutations was very low. In the initial testing, the small seeded crops were not grown to maturity to check for mutation and obtain a second generation seed. These small seeded crops are now being grown for evaluation. Author

N92-27324*# Schafer (W. J.) Associates, Inc., Washington, DC.
LDEF ARCHIVAL SYSTEM PLAN Abstract Only **c82**
Brenda K. Wilson *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 125 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Long Duration Exposure Facility (LDEF) Science Office is developing a comprehensive archival system to enable access to LDEF data, analysis, publications, and hardware for further research and design applications. The archival system will be a space environmental effects resource designed to encompass other data relevant to the space environment in addition to that which has resulted from LDEF. Elements of the archival system will include electronically stored data, hardcopies, photographs, hardware, and samples. Currently LDEF data and analytical results are being recorded by principal investigators and special investigation groups in many forms and for both inhouse uses and outside distribution. It is intended that the LDEF archival system will include access to some of these independent sources of information as part of the complete archives. This paper will discuss the LDEF archival system, including the procedures for acquiring information and hardware. Author

N92-27325*# American Space Technology, Inc., Santa Monica, CA.
RETRIEVABLE PAYLOAD CARRIER. NEXT GENERATION LONG DURATION EXPOSURE FACILITY: UPDATE 1992 Abstract Only **c18**
A. T. Perry, J. A. Cagle, and S. C. Newman *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 126 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Access to space and cost have been two major inhibitors of low Earth orbit research. The Retrievable Payload Carrier (RPC) Program is a commercial space program which strives to overcome these two barriers in space experimentation. The RPC Program's fleet of spacecraft, ground communications station, payload processing facility, and experienced integration and operations team will provide a convenient 'one stop shop' for investigators seeking to use the unique vantage point and environment of low Earth orbit for research. The RPC is a regularly launched and retrieved, free-flying spacecraft providing resources adequate to meet modest payload/experiment requirements, and presenting ample surface area, volume, mass, and growth capacity for investigator usage. Mission lengths of 6-18 months are envisioned. Presented here is an update on progress made on the RPC Program's development since the November 1991 LDEF Materials Workshop. Author

N92-27326*# AZ Technology, Huntsville, AL.
NEXT GENERATION OPTICAL INSTRUMENTS AND SPACE EXPERIMENTS BASED ON THE LDEF THERMAL CONTROL SURFACES EXPERIMENT (S0069) Abstract Only **c74**
Donald R. Wilkes *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 127 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Thermal Control Surfaces Experiment (TCSE) on the Long Duration Exposure Facility (LDEF) was a very effective experiment to study the effects of the space environment on thermal control surfaces. Three current programs have benefitted from the TCSE experiment and are the: Optical Properties Monitor (OPM); Laboratory Portable Spectroreflectometer (LPSR); and Space Portable Spectroreflectometer. The OPM expands the TCSE optical measurement and environmental monitoring capability. The LPSR is a hand held instrument developed to measure the spectral total hemispherical reflectance of small and larger surfaces in the field. The SPSR is a space application of the LPSR and TCSE technologies with the same measurement capabilities. The SPSR will be able to characterize the external surfaces of operational spacecraft such as Space Station Freedom. Author

N92-27327*# Canadian Space Agency, Ottawa (Ontario). Space Station Program Office.
THE CANADIAN SPACE AGENCY, SPACE STATION, STRATEGIC TECHNOLOGIES FOR AUTOMATION AND ROBOTICS PROGRAM TECHNOLOGY DEVELOPMENT ACTIVITY IN PROTECTION OF MATERIALS FROM THE LOW EARTH ORBIT SPACE ENVIRONMENT Abstract Only **c12**
J. R. Francoeur *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 128 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The Strategic Technologies in Automation and Robotics (STEAR) program is managing a number of development contracts to improve the protection of spacecraft materials from the Low Earth Orbit (LEO) space environment. The project is structured in two phases over a 3 to 4 year period with a budget of 3 to 4 million dollars. Phase 1 is designed to demonstrate the technical feasibility and commercial potential of a coating/substrate system and its associated application process. The objective is to demonstrate a prototype fabrication capability using a full scale component of a commercially viable process for the protection of materials and surface finishes from the LEO space environment, and to demonstrate compliance with a set of performance requirements. Only phase 1 will be discussed in this paper.
Author

N92-27328*# Chicago Univ., IL. Lab. for Astrophysics and Space Research.
INSTRUMENTATION FOR NEAR-EARTH MEASUREMENT OF ORBITAL DEBRIS AND COSMIC DUST PARTICLES Abstract Only **c35**
Anthony J. Tuzzolino *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 129 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

Dust instrumentation based on polyvinylidene fluoride (PVDF) dust sensor arrays is described which will measure the masses, fluxes, velocities, and trajectories of orbital debris particles and natural micrometeoroids. Orbital debris particles are distinguished from natural particles (cosmic dust) by means of the velocity/trajectory information. The instrumentation will measure particle trajectory with a mean error of approximately 7 degrees (for isotropic flux) and is designed for measurements over the particle diameter range of approximately 2 to 200 micro-m. For future missions having Earth-return capabilities, arrays of capture cell devices positioned behind the PVDF trajectory system would provide for Earth-based chemical and isotopic analysis of captured dust.
Author

N92-27329*# Hulburt (E. O.) Center for Space Research, Washington, DC.
FUTURE RADIATION MEASUREMENTS IN LOW EARTH ORBIT Abstract Only **c72**
James H. Adams, Jr. *In* NASA. Langley Research Center, Second LDEF Post-Retrieval Symposium Abstracts Jun. 1992 p 130 (For primary document see N92-27218 18-99)
Avail: NTIS HC/MF A07

The first Long Duration Exposure Facility (LDEF) mission has demonstrated the value of the LDEF concept for deep surveys of the space radiation environment. This paper will survey the types of measurements that could be done on a second LDEF mission. One of the most surprising discoveries on LDEF1 was the Be-7 that was found imbedded on the windward surface. LDEF2 could follow up on this discovery and search for evidence of other cosmogenic nuclei. Another experiment could be designed to investigate the presence of energetic heavy ions observed on LDEF1. The relative abundance of rare earths can also be used to search for evidence that cosmic rays accelerate in episodes which occur throughout their propagation in the stellar medium. Further investigations of radiation effects could also be undertaken. A second LDEF mission also offers the opportunity for new investigations such as measurements of cosmic ray differential energy spectrum to ultrahigh energies. These and other ideas will be discussed.
Author

N92-27360*# National Aeronautics and Space Administration, Washington, DC.
RESEARCH AND TECHNOLOGY OBJECTIVES AND PLANS SUMMARY (RTOPS) Research and Technology Program, FY 1990
Feb. 1990 228 p
(NASA-TM-101862; NAS 1.15:101862) Avail: NTIS HC/MF A11

The NASA research and technology program for FY 1990 is presented. The summary portions is compiled of each of the RTOPs (Research and Technology Objectives and Plans) used for management review and control of research currently in progress throughout NASA. The RTOP summary is designed to facilitate communication and coordination among concerned technical personnel in government, industry, and universities. The first section containing citations and abstracts of the RTOPs is followed by four indices: Subject; Technical Monitor; Responsible NASA Organization; and RTOP number.
Author

N92-27593# Defense Advanced Research Projects Agency, Arlington, VA.
FY 1992/1993 BIENNIAL RDT AND E DESCRIPTIVE SUMMARIES: DARPA. AMENDED
Jan. 1992 91 p
(AD-A247452) Avail: NTIS HC/MF A05

This report is a compilation of DARPA fiscal year 1992 and 1993 Research Development Technology and Engineering description summaries. The topics include: military budgets for procurement neural nets, microchips, physical science, lasers, composite structures, electronic science, toxic chemical wastes, materials science, software engineering, and electronic research.
GRA

N92-28078# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. HIGH SCHOOL APPRENTICESHIP PROGRAM (HSAP) REPORTS. VOLUME 13: WRIGHT LABORATORY Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 558 p
(Contract F49620-90-C-0076)
(AD-A248776; AFOSR-92-0180TR-Vol-13) Avail: NTIS HC/MF A24

High school students who live in communities where Air Force laboratories are located have an opportunity to spend eight weeks during the summer doing scientific research at the laboratory. Each student is assigned a mentor from the laboratory. During the summer of 1991 132 students participated in the program. Each student was required to submit a report on their accomplishments. Those student reports were consolidated and bound into this annual report.
GRA

N92-28096# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. GRADUATE STUDENT RESEARCH PROGRAM (GSRP) REPORTS. VOLUME 9: WRIGHT LABORATORY Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 722 p
(Contract F49620-90-C-0076)
(AD-A248772; AFOSR-92-0176TR-Vol-9) Avail: NTIS HC/MF A99

This program was started in 1982 as an adjunct to the SFRP. Its objectives are to permit graduate students to participate in research under the direction of a faculty member at an Air Force laboratory; stimulate professional association among graduate students, their supervising professors, and professional peers in the Air Force; to further research objectives of the Air Force; and to expose graduate students to potential thesis topics in areas of interest to the Air Force. During the summer of 1991, 142 graduate students performed research for 10 weeks at Air Force laboratories. Their reports were submitted to RDL and consolidated into this annual report.
GRA

N92-28097# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. HIGH SCHOOL APPRENTICESHIP PROGRAM (HSAP) REPOORTS. VOLUME 10: ARMSTRONG LABORATORY Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 422 p
(Contract F49620-90-C-0076)
(AD-A248773; AFOSR-92-0177TR-Vol-10) Avail: NTIS HC/MF A18

High school students who live in communities where Air Force laboratories are located have an opportunity to spend eight weeks

during the summer doing scientific research at the laboratory. Each student is assigned a mentor from the laboratory. During the summer of 1991, 132 students participated in the program. Each student was required to submit a report on their accomplishments. Those student reports were consolidated and bound into this annual report. GRA

N92-28098# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. HIGH SCHOOL APPRENTICESHIP PROGRAM (HSAP) REPORTS. VOLUME 11: PHILLIPS LABORATORY, CIVIL ENGINEERING LABORATORY Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 387 p
(Contract F49620-90-C-0076)
(AD-A248774; AFOSR-92-0178TR-Vol-11) Avail: NTIS HC/MF A17

High school students who live in communities where Air Force laboratories are located have an opportunity to spend eight weeks during the summer doing scientific research at the laboratory. Each student is assigned a mentor from the laboratory. During the summer of 1991, 132 students participated in the program. Each student was required to submit a report on their accomplishments. Those student reports were consolidated and bound into this annual report. GRA

N92-28099# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. HIGH SCHOOL APPRENTICESHIP PROGRAM (HSAP) REPORTS. VOLUME 12: ROME LABORATORY, ARNOLD ENGINEERING DEVELOPMENT CENTER Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 430 p
(Contract F49620-90-C-0076)
(AD-A248775; AFOSR-92-0179TR-Vol-12) Avail: NTIS HC/MF A19

High school students who live in communities where Air Force laboratories are located have an opportunity to spend eight weeks during the summer doing scientific research at the laboratory. Each student is assigned a mentor from the laboratory. During the summer of 1991, 132 students participated in the program. Each student was required to submit a report on their accomplishments. Those student reports were consolidated and bound into this annual report. GRA

N92-28109# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. GRADUATE STUDENT RESEARCH PROGRAM (GSRP) REPORTS. VOLUME 6: ARMSTRONG LABORATORY, WILFORD HALL MEDICAL CENTER Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 546 p
(Contract F49620-90-C-0076)
(AD-A248769; AFOSR-92-0173TR-Vol-6) Avail: NTIS HC/MF A23

This program was started in 1982 as an adjunct to the SFRP. Its objectives are to permit graduate students to participate in research under the direction of a faculty member at an Air Force laboratory; stimulate professional association among graduate students, their supervising professors, and professional peers in the Air Force; to further research objectives of the Air Force; and to expose graduate students to potential thesis topics in areas of interest to the Air Force. During the summer of 1991, 142 graduate students performed research for 10 weeks at Air Force laboratories. Their reports were submitted to RDL and consolidated into this annual report. GRA

N92-28110# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. GRADUATE STUDENT RESEARCH PROGRAM (GSRP) REPORTS. VOLUME 7: PHILLIPS LABORATORY, CIVIL ENGINEERING LABORATORY Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 393 p
(Contract F49620-90-C-0076)
(AD-A248770; AFOSR-92-0174TR-Vol-7) Avail: NTIS HC/MF A17

This program was started in 1982 as an adjunct to the SFRP. Its objectives are to permit graduate students to participate in research under the direction of a faculty member at an Air Force laboratory; stimulate professional association among graduate students, their supervising professors, and professional peers in the Air Force; to further research objectives of the Air Force; and to expose graduate students to potential thesis topics in areas of interest to the Air Force. During the summer of 1991, 142 graduate students performed research for 10 weeks at Air Force laboratories. Their reports were submitted to RDL and consolidated into this annual report. GRA

N92-28111# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. GRADUATE STUDENT RESEARCH PROGRAM (GSRP) REPORTS. VOLUME 8: ROME LABORATORY, ARNOLD ENGINEERING DEVELOPMENT CENTER, F. J. SEILER RESEARCH LABORATORY Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 636 p
(Contract F49620-90-C-0076)
(AD-A248771; AFOSR-92-0175TR-Vol-8) Avail: NTIS HC/MF A99

This program was started in 1982 as an adjunct to the SFRP. Its objectives are to permit graduate students to participate in research under the direction of a faculty member at an Air Force laboratory; stimulate professional association among graduate students, their supervising professors, and professional peers in the Air Force; to further research objectives of the Air Force; and to expose graduate students to potential thesis topics in areas of interest to the Air Force. During the summer of 1991, 142 graduate students performed research for 10 weeks at Air Force laboratories. Their reports were submitted to RDL and consolidated into this annual report. GRA

N92-28127# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. SUMMER FACULTY RESEARCH PROGRAM (SFRP) REPORTS. VOLUME 5A: WRIGHT LABORATORY Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 528 p
(Contract F49620-90-C-0076)
(AD-A248767; AFOSR-92-0171TR-Vol-5A) Avail: NTIS HC/MF A23

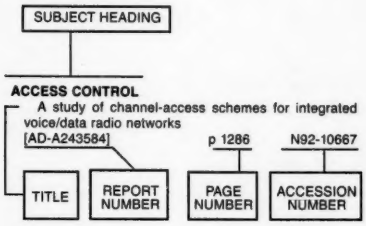
The purpose of this program is to develop the basis for continuing research of interest to the Air Force at the institution of the faculty member; to stimulate continuing relations among faculty members and professional peers in the Air Force; to enhance the research interests and capabilities of scientific and engineering educators; and to provide follow-on funding for research of particular promise that was started at an Air Force laboratory under the Summer Faculty Research Program. During the summer of 1991, 170 university faculty conducted research at Air Force laboratories for a period of 10 weeks. Each participant provided a report of their research, and these reports are consolidated into this annual report. GRA

N92-28128# Research and Development Labs., Culver City, CA.
UNITED STATES AIR FORCE SUMMER RESEARCH PROGRAM 1991. SUMMER FACULTY RESEARCH PROGRAM (SFRP) REPORTS. VOLUME 5B: WRIGHT LABORATORY Report, 30 Sep. 1990 - 30 Sep. 1991
Gary Moore 9 Jan. 1992 496 p
(Contract F49620-90-C-0076)
(AD-A248768; AFOSR-92-0172TR-Vol-5B) Avail: NTIS HC/MF A21

The purpose of this program is to develop the basis for continuing research of interest to the Air Force at the institution of the faculty member; to stimulate continuing relations among

faculty members and professional peers in the Air Force; to enhance the research interests and capabilities of scientific and engineering educators; and to provide follow-on funding for research of particular promise that was started at an Air Force laboratory under the Summer Faculty Research Program. During the summer of 1991, 170 university faculty conducted research at Air Force laboratories for a period of 10 weeks . Each participant provided a report of their research, and these reports are consolidated into this annual report. GRA

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The page number helps you locate the the citation in the abstract section. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus*.

A

A STARS
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636

ABILITIES
Profile of an effective engineering manager
[AD-A246525] p 3180 N92-27528

ABSORBERS (MATERIALS)
Sound attenuation characteristics of the DH-133A helmet
[AD-A248351] p 3143 N92-27991

ABSORPTION SPECTRA
Spectral infrared hemispherical reflectance measurements for LDEF tray clamps p 3170 N92-27295
The incidence and nature of absorption line profile variations among the O stars
[ISBN-0-315-56945-X] p 3189 N92-27684
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835

ABSORPTION SPECTROSCOPY
Physics and diagnostics of laser ablation plume propagation for high-(Tc) superconductor film growth
[DE92-009386] p 3171 N92-27362
Vibrational spectroscopic studies of surface chemical interactions in chemisorption and catalysis
[DE92-011189] p 3072 N92-28046

ABSTRACTS
Research and Technology Objectives and Plans Summary (RTOPS)
[NASA-TM-101862] p 3218 N92-27360

ACCELERATION STRESSES (PHYSIOLOGY)
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 3
[CTN-92-60539] p 3143 N92-27358
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371

ACCELERATION TOLERANCE
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 3
[CTN-92-60539] p 3143 N92-27358
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371

ACCELEROMETERS
RMS active damping augmentation p 3155 N92-27771
Nonlinear aspects of shock response in isolated accelerometers
[DE92-010827] p 3107 N92-28054

ACCESS CONTROL
Applying the take-grant protection model
[NASA-CR-190439] p 3147 N92-27561
A proactive password checker
[NASA-CR-190438] p 3148 N92-27626

ACCOUNTING
A micro computer based procurement system: An application of reverse engineering techniques
[AD-A245956] p 3147 N92-27544

ACCRETION DISKS
Self-similar spiral structure in astrophysical disks
[ISBN-0-315-61539-7] p 3191 N92-27701

ACCUMULATORS
Contamination measurements on experiment M0003 p 3073 N92-27298

ACIDS
Macrocycles containing tin
[AD-A246866] p 3163 N92-27351
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

ACOUSTIC ATTENUATION
Testing the accuracy of a three-dimensional acoustic coupled mode model
[AD-A247149] p 3162 N92-27369
Sound attenuation characteristics of the DH-133A helmet
[AD-A248351] p 3143 N92-27991

ACOUSTIC EMISSION
Monitoring of global acoustic transmissions: Signal processing and preliminary data analysis
[AD-A246572] p 3162 N92-27532

ACOUSTIC EXCITATION
Explicit solution of difference equation for the wavenumber response of fluid-loaded stiffened plate
[AD-A247922] p 3116 N92-27850

ACOUSTIC FREQUENCIES
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655

ACOUSTIC PROPERTIES
Three-dimensional Ocean Thermal Structure (TOTS) software module software requirements specifications
[AD-A246146] p 3134 N92-27575
Explicit solution of difference equation for the wavenumber response of fluid-loaded stiffened plate
[AD-A247922] p 3116 N92-27850
Steady-state acoustical noise measurements in aviation systems
[AD-A247831] p 3162 N92-27924

ACOUSTIC VELOCITY
Acoustic tomography in the Greenland Sea
[AD-A246574] p 3133 N92-27533
Three-dimensional Ocean Thermal Structure (TOTS) software module software requirements specifications
[AD-A246146] p 3134 N92-27575

ACQUISITION
Establishing a Department of Defense program management body of knowledge
[AD-A246625] p 3182 N92-27979

ACRYLATES
X ray scattering studies of polyimide thin films from poly(amic acid)s functionalized with a methacrylate
[DE92-010120] p 3075 N92-27364

ACTIVATION
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

ACTIVE CONTROL
Development of an active damping system to aid in the attitude control of flexible spacecraft
[AD-A246248] p 3050 N92-27200
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
A microgravity vibration isolation rig p 3060 N92-27745
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
RMS active damping augmentation p 3155 N92-27771
An evaluation of some strategies for vibration control of flexible rotors p 3063 N92-27800
Self-adaptive aeropropulsion components-enhancing axial compressor performance
[AD-A246123] p 3049 N92-27817

ACTIVE GALACTIC NUCLEI
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636

ACTIVITY (BIOLOGY)
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991
[NASA-TM-107546] p 3136 N92-27877

ACTUATORS
Magnetostrictive direct drive motors
[NASA-CR-190451] p 3089 N92-27404
Antenna pointing system mounted on a flexible space structure
[NAL-TR-1119] p 3110 N92-27432
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627
Dynamics and control of high precision magnetically levitated vibration isolation systems p 3058 N92-27730
A six degree-of-freedom magnetic bearing for microgravity vibration isolation p 3058 N92-27732
A microgravity vibration isolation rig p 3060 N92-27745
The concept of the mechanically active guideway as a novel approach to maglev p 3064 N92-27807
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809

ADA (PROGRAMMING LANGUAGE)
Using Ada bindings to the X window system
[AD-A245366] p 3146 N92-27436

ADAPTATION
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
An evolutionary approach to designing neural networks
[AD-A247003] p 3157 N92-27987
Individual differences in adaptive processing in complex learning and cognitive performance
[AD-A248586] p 3142 N92-28179

ADAPTIVE CONTROL
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
Integrated multi-domain radar demonstration
[AD-A246653] p 3084 N92-27758
An evaluation of some strategies for vibration control of flexible rotors p 3063 N92-27800

ADAPTIVE FILTERS
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785

ADDITIVES
Levitation of YBa2Cu3O(7-x) superconductor in a variable magnetic field p 3059 N92-27735
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Active fibres and optical amplifiers p 3086 N92-28089
Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials
[AD-A248736] p 3078 N92-28126

ADHESION TESTS
Determination of minimum adherend thickness for climbing drum and floating roller adhesive tests
[AD-A248883] p 3111 N92-27996
ADHESIVES
Evaluation of seals, lubricants, and adhesives used on LDEF p 3111 N92-27299
Determination of minimum adherend thickness for climbing drum and floating roller adhesive tests
[AD-A248883] p 3111 N92-27996
ADIABATIC FLOW
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle
p 3100 N92-27482
ADJUSTING
Pivoting seat for fighter aircraft
[AD-D015244] p 3143 N92-27372
ADSORPTION
Spectroscopy and reactions of hydrazoic acid on silicon single crystal surfaces. (2). HN3 and DN3 on Si (100)
[AD-A247047] p 3177 N92-28077
Atomic-level structure and dynamics of ordered metal electrodes as probed by infrared spectroscopy and scanning tunneling microscopy
[AD-A246738] p 3164 N92-28105
ADVANCED VERY HIGH RESOLUTION RADIOMETER
Three-dimensional Ocean Thermal Structure (TOTS) software module software requirements specifications
[AD-A246146] p 3134 N92-27575
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques
[AD-A246066] p 3135 N92-27786
ADVECTION
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
AERODYNAMIC BALANCE
Wind tunnel magnetic Suspension Systems at the University of Southampton, England
p 3053 N92-27804
AERODYNAMIC CHARACTERISTICS
Navier-Stokes analysis of turbine blade heat transfer and performance p 3097 N92-27468
Wind tunnel magnetic Suspension Systems at the University of Southampton, England
p 3053 N92-27804
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870
Computations of unsteady flows around airfoil sections by explicit and implicit methods solving the Euler and Navier-Stokes equations p 3039 N92-27948
AERODYNAMIC CONFIGURATIONS
Application of S1BYL2 to the AGARD WG18 compressor test cases p 3094 N92-27452
Transonic wind tunnel investigation of limit cycle oscillations on fighter type wings p 3041 N92-27959
AERODYNAMIC DRAG
Special Course on Skin Friction Drag Reduction
[AGARD-R-786] p 3036 N92-27706
Basic concepts on boundary layers
p 3036 N92-27707
Drag reduction: An industrial challenge
p 3036 N92-27708
Aircraft drag reduction p 3036 N92-27709
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
AERODYNAMIC FORCES
Propulsion simulator for magnetically suspended wind tunnel models p 3052 N92-27801
Wind tunnel magnetic Suspension Systems at the University of Southampton, England
p 3053 N92-27804
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream
p 3039 N92-27946
Direct coupling of fluid structure in transonic aeroelasticity p 3040 N92-27954
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956
AERODYNAMIC LOADS
Progress of magnetic suspension and balance systems for wind tunnels in the USSR p 3053 N92-27803
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947
Computation of flutter boundaries in the time and frequency domain p 3040 N92-27952
AERODYNAMIC STABILITY
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications
p 3037 N92-27937
AERODYNAMIC STALLING
Pressure-based high-order TVD methodology for dynamic stall control
[AD-A247056] p 3105 N92-27918
AERODYNAMICS
Experimental investigation of turbulence behavior in shock wave/turbulent boundary layer interactions
[AD-A247792] p 3104 N92-27886
Aeronautical engineering: A continuing bibliography with indexes (supplement 277)
[NASA-SP-7037(277)] p 3035 N92-27929
Comparison of Euler and full potential methods for unsteady transonic flow calculations
p 3038 N92-27943
AEROELASTICITY
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications
p 3037 N92-27937
Unstructured-grid methods development for unsteady aerodynamic and aeroelastic analyses
p 3038 N92-27938
Unsteady aerodynamics for aeroelasticity at the Flight Dynamics Directorate p 3038 N92-27939
Recent applications of linear and nonlinear unsteady aerodynamics for aeroelastic analysis
p 3038 N92-27940
Comparison of Euler and full potential methods for unsteady transonic flow calculations
p 3038 N92-27943
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947
Transonic aeroelastic calculations in both the time and frequency domains p 3040 N92-27950
Aeroelastic calculations for fighter aircraft using the transonic small disturbance equation
p 3040 N92-27951
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow
p 3040 N92-27953
Direct coupling of fluid structure in transonic aeroelasticity p 3040 N92-27954
Investigation of the aeroelastic stability of the AFW wind-tunnel model using CAP-TSD p 3040 N92-27955
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
p 3041 N92-27958
The benchmark aeroelastic models program: Description and highlights of initial results
p 3041 N92-27960
AEROEMBOLISM
Inspired gas composition influences recovery from experimental venous air embolism
[AD-A247004] p 3138 N92-28135
AEROMANEUVERING
Performance analysis of non-coplanar synergetic maneuvers
[AD-A246576] p 3054 N92-27534
AERONAUTICAL ENGINEERING
Aeronautical engineering: A continuing bibliography with indexes (supplement 277)
[NASA-SP-7037(277)] p 3035 N92-27929
Development of telemetry for the agility flight test of a radio controlled fighter model
[AD-A248653] p 3055 N92-27994
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 13: The information-seeking habits and practices of engineers
[NASA-TM-107931] p 3185 N92-28114
AEROSOLS
A procedure for obtaining an algebraic approximation to certain integrals
[AD-A245371] p 3157 N92-27437
Laboratory measurements of the transmission and scattering of laser beams in optically dense clouds
[ISBN-0-315-58085-2] p 3108 N92-27647
The design, development, and test of balloonborne and groundbased lidar systems. Volume 2: Flight test of Atmospheric Balloon Lidar Experiment, ABLE 2
[AD-A246727] p 3087 N92-28103
AEROSPACE ENGINEERING
System requirements specification for SMART structures mode p 3149 N92-27830
Activities, accomplishments and research progress of the Center for Theoretical Geoplasma Physics, Center for Space Research, Massachusetts Inst. of Technology
[AD-A248572] p 3127 N92-27963
AFRAPT Program at Texas A and M University research for advanced aircraft engine structures
[AD-A247040] p 3049 N92-28076
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 13: Wright Laboratory
[AD-A248776] p 3218 N92-28078
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 9: Wright Laboratory
[AD-A248772] p 3218 N92-28096
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) repoorts. Volume 10: Armstrong Laboratory
[AD-A248773] p 3218 N92-28097
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 11: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248774] p 3219 N92-28098
United States Air Force Summer Research program 1991. High School Apprenticeship Program (HSAP) reports. Volume 12: Rome Laboratory, Arnold Engineering Development Center
[AD-A248775] p 3219 N92-28099
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 6: Armstrong Laboratory, Wilford Hall Medical Center
[AD-A248769] p 3219 N92-28109
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 7: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248770] p 3219 N92-28110
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 8: Rome Laboratory, Arnold Engineering Development Center, F. J. Seiler Research Laboratory
[AD-A248771] p 3219 N92-28111
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 3: The impact of a sponsor letter on mail survey response rates
[NASA-TM-107923] p 3185 N92-28112
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 8: The role of the information intermediary in the diffusion of aerospace knowledge
[NASA-TM-107949] p 3185 N92-28113
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 17: The relationship between seven variables and the use of US government technical reports by US aerospace engineers and scientists
[NASA-TM-107950] p 3186 N92-28115
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 15: Technical communications in the international workplace: Some implications for curriculum development
[NASA-TM-107926] p 3186 N92-28116
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 22: Establishing a research agenda for Scientific and Technical Information (STI): Focus on the user
[NASA-TM-107930] p 3186 N92-28117
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5A: Wright Laboratory
[AD-A248767] p 3219 N92-28127
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5B: Wright Laboratory
[AD-A248768] p 3219 N92-28128
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 20: Engineers as information processors: A survey of US aerospace engineering faculty and students
[NASA-TM-107928] p 3186 N92-28155
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 14: An analysis of the technical communications practices reported by Israeli and US aerospace engineers and scientists
[NASA-TM-107924] p 3186 N92-28183
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 21: Technological innovation and technical communications: Their place in aerospace engineering curricula. A survey of European, Japanese, and US Aerospace Engineers and Scientists
[NASA-TM-107929] p 3187 N92-28184
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 19: Computer and information technology and aerospace knowledge diffusion
[NASA-TM-107927] p 3187 N92-28211
AEROSPACE ENVIRONMENTS
Evaluation of long-duration exposure to the natural space environment on the mechanical properties of carbon-reinforced epoxy and polyimide composites
p 3070 N92-27291
Surface analyses of composites exposed to the space environment on LDEF p 3070 N92-27293

Thermal expansion behavior of LDEF metal matrix composites p 3070 N92-27294
Contamination on LDEF sources: Distribution and history p 3073 N92-27297
Effects of long term space environment exposure on optical substrates and coatings (S0050-2) p 3170 N92-27310
Next generation optical instruments and space experiments based on the LDEF thermal control surfaces experiment (S0069) p 3171 N92-27326
The use of electrical transmission line theory to predict the performance of spacecraft radiators [AD-A247786] p 3091 N92-27861
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991 [NASA-TM-107546] p 3136 N92-27877

AEROSPACE INDUSTRY
An educational space seminar to increase American student interest in space careers [AD-A246565] p 3179 N92-27499
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 8: The role of the information intermediary in the diffusion of aerospace knowledge [NASA-TM-107949] p 3185 N92-28113
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research [NASA-TM-107925] p 3187 N92-28220

AEROSPACE MEDICINE
The scope of acceleration-induced loss of consciousness research [AD-A247872] p 3137 N92-27371
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 361) [NASA-SP-7011(361)] p 3137 N92-27433
Ergonomics manual [AD-A246934] p 3143 N92-28071

AEROSPACE PLANES
JPRS report: Science and technology. Central Eurasia: Space [JPRS-USP-92-001] p 3053 N92-27931
Project MAKS air-launched spaceplane p 3053 N92-27934
Robust intelligent flight control for hypersonic vehicles [NASA-CR-185680] p 3051 N92-28209

AEROSPACE SYSTEMS
Some advances in US space defense systems [AD-A246038] p 3160 N92-27658

AEROSPACE TECHNOLOGY TRANSFER
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 19: Computer and information technology and aerospace knowledge diffusion [NASA-TM-107927] p 3187 N92-28211
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research [NASA-TM-107925] p 3187 N92-28220

AEROSPACE VEHICLES
Geometric modeling for computer aided design [NASA-CR-190363] p 3149 N92-27829
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages p 3149 N92-27831
Life prediction methodologies for composite materials [AD-A248637] p 3070 N92-28202

AEROTHERMODYNAMICS
Presentation of a computational code for 3-D compressible flow in complex channels and cavities p 3098 N92-27475
Aerothermodynamics of nozzle flows for advanced hypersonic propulsion systems p 3099 N92-27478

AGGLOMERATION
Clustering of faint galaxies [ISBN-0-315-53743-4] p 3189 N92-27686
Gravitational clustering of galaxies: Distribution of galaxy counts in cells [ISBN-0-315-59910-3] p 3190 N92-27687

AGING (MATERIALS)
Human factors evaluation of the work environment of operators engaged in the inspection and repair of aging aircraft [AD-A246445] p 3043 N92-27914

AGRICULTURAL AIRCRAFT
Trajectories and stability of trailing vortices very near the ground [NRC-32151] p 3035 N92-27344

AGRICULTURE
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site p 3120 N92-28018
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert p 3088 N92-28025
Global climate change and international security [DE92-010868] p 3125 N92-28056

AILERONS
Evaluation of high lift devices of the quiet STOL experimental aircraft ASKA [NAL-TR-1102] p 3046 N92-28153

AIR BREATHING ENGINES
Aerothermodynamics of nozzle flows for advanced hypersonic propulsion systems p 3099 N92-27478
Robust intelligent flight control for hypersonic vehicles [NASA-CR-185680] p 3051 N92-28209

AIR CURRENTS
Persistent circulation anomalies in observations and in a general circulation model [ISBN-0-315-57198-5] p 3127 N92-27642
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques [AD-A246066] p 3135 N92-27786

AIR DEFENSE
Technology trends, threats, and opportunities (T(sup 3)O). Part 4: Proceedings of Workshop on Critical Enabling Technologies [CTN-92-60495] p 3181 N92-27703
An information systems architecture analysis for Naval Air Systems Command [AD-A247787] p 3184 N92-27885
Air situation establishment in a mobile multisensor environment p 3031 N92-27891
Situation assessment in the Paladin tactical decision generation system p 3032 N92-27892
A teamwork model of pilot aiding: Psychological principles for mission management systems design p 3032 N92-27893
Optimal guidance anticipating missile performance p 3034 N92-27902

AIR FILTERS
Application of CFD in the design of gas turbine engine components p 3049 N92-27461

AIR FLOW
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance [AD-A247298] p 3143 N92-27990

AIR INTAKES
CFD contributions during hypersonic airplane intake design p 3098 N92-27472

AIR LAND INTERACTIONS
Coastally trapped disturbances in the lower atmosphere [ISBN-0-315-55186-0] p 3129 N92-27622

AIR LAUNCHING
Project MAKS air-launched spaceplane p 3053 N92-27934

AIR MASSES
Modeling and observational studies of mesoscale air-mass boundaries and warm-season convective precipitation [AD-A247030] p 3128 N92-27336
Coastally trapped disturbances in the lower atmosphere [ISBN-0-315-55186-0] p 3129 N92-27622

AIR POLLUTION
Emissions trading and compliance: Regulatory incentives and barriers [DE92-010280] p 3125 N92-27571
Air pollution effects on biodiversity [PB92-170166] p 3125 N92-28208

AIR QUALITY
Emissions trading and compliance: Regulatory incentives and barriers [DE92-010280] p 3125 N92-27571
Clean air act requirements for trace metals information [PB92-164995] p 3125 N92-28206

AIR SEA ICE INTERACTIONS
Review of the physical oceanography of the Labrador Sea [CGCR-90-12] p 3132 N92-27357

AIR TO SURFACE MISSILES
Design and testing of a caseless solid-fuel integral-rocket ramjet engine for use in small tactical missiles [AD-A246226] p 3066 N92-27198

AIR TRAFFIC
Implementation and operational experience with a new arrival traffic management system at the Frankfurt ATC-Center p 3034 N92-27905

AIR TRAFFIC CONTROL
Effects of color vision deficiency on detection of color-highlighted targets in a simulated air traffic control display [AD-A246586] p 3139 N92-27500
JTIDS electromagnetic compatibility in the 960-1215 MHz band [AD-A247834] p 3085 N92-27864
Air Vehicle Mission Control and Management [AGARD-CP-504] p 3031 N92-27887
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant p 3032 N92-27895
On board planning of 4D-trajectories p 3033 N92-27897
Implementation and operational experience with a new arrival traffic management system at the Frankfurt ATC-Center p 3034 N92-27905
A formal definition of the object-oriented paradigm for requirements analysis [AD-A246814] p 3044 N92-28132

AIR TRANSPORTATION
An analysis of fixed wing tactical airlifter characteristics using an intra-theater airlift computer model [AD-A246908] p 3045 N92-27719
Technology and standards for a common air mission planner p 3033 N92-27899
Human factors evaluation of the work environment of operators engaged in the inspection and repair of aging aircraft [AD-A246445] p 3043 N92-27914

AIR WATER INTERACTIONS
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991 [AD-A246444] p 3135 N92-27666
AES/NSERC Industrial Research Chairs (IRC) in climate research [CGCR-91-9] p 3125 N92-28200

AIRBORNE EQUIPMENT
Meteorological measurement guide [AD-A247455] p 3130 N92-27859
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop [NASA-CR-190461] p 3119 N92-28013
Dual frequency along-track interferometry p 3088 N92-28024
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030
Information content of polarimetric SAR data p 3088 N92-28033
Geometric rectification and geocoding of JPL's AIRSAR data over hilly terrain p 3088 N92-28035
Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038

AIRBORNE LASERS
Adaptive compression of multisensor image data [AD-A248389] p 3151 N92-28006

AIRCRAFT
Small satellites and RPAs in global-change research, summary and conclusions [AD-A247855] p 3055 N92-27388

AIRCRAFT ACCIDENTS
Composite profiles of helicopter mishaps at heliports and airports [AD-A248887] p 3043 N92-28052

AIRCRAFT COMMUNICATION
Mid-range UV communications --- ultraviolet radiation [AD-D015213] p 3083 N92-27615
Advances in Fibre-Optic Technology in Communications and for Guidance and Control [AGARD-LS-184] p 3086 N92-28084
Fiber optic data busses for aircraft p 3048 N92-28093

AIRCRAFT CONFIGURATIONS
Comparison of Janus and field test aircraft detection ranges for the line-of-sight forward heavy system [AD-A246047] p 3083 N92-27600
Recent applications of linear and nonlinear unsteady aerodynamics for aeroelastic analysis p 3038 N92-27940
Development of telemetry for the agility flight test of a radio controlled fighter model [AD-A248653] p 3055 N92-27994

AIRCRAFT CONSTRUCTION MATERIALS
Ceramic composites: Enabling aerospace materials [NASA-TM-105599] p 3076 N92-27378
The effect of jet fuel exposure on advanced aerospace composites. Part 1: Thermal and chemical analysis [AD-A246559] p 3068 N92-27531
Life prediction methodologies for composite materials [AD-A248637] p 3070 N92-28202

AIRCRAFT DESIGN
NAL Dornier 228-200 flight research airplane: Present status and outline of the installed equipment [NAL-TM-637] p 3045 N92-27429
CFD contributions during hypersonic airplane intake design p 3098 N92-27472

System requirements specification for SMART structures mode p 3149 N92-27830
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages p 3149 N92-27831
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191

AIRCRAFT DETECTION
Comparison of Janus and field test aircraft detection ranges for the line-of-sight forward heavy system
[AD-A246047] p 3083 N92-27600

AIRCRAFT ENGINES
Thermally sprayed coating systems for surface protection and clearance control applications in aero engines
[PNR-90802] p 3048 N92-27422
Three dimensional calculations of reactive flows within aircraft combustion chambers including some combustion models p 3101 N92-27490
Self-adaptive aeropropulsion components-enhancing axial compressor performance
[AD-A246123] p 3049 N92-27817
AFRAPT Program at Texas A and M University research for advanced aircraft engine structures
[AD-A247040] p 3049 N92-28076
An appraisal of cost-effectiveness models used in the Air Force and Navy aircraft engine component improvement programs
[AD-A245910] p 3049 N92-28162

AIRCRAFT EQUIPMENT
Pivoting seat for fighter aircraft
[AD-D015244] p 3143 N92-27372

AIRCRAFT GUIDANCE
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916
Advances in Fibre-Optic Technology in Communications and for Guidance and Control
[AGARD-LS-184] p 3086 N92-28084

AIRCRAFT MAINTENANCE
Human factors evaluation of the work environment of operators engaged in the inspection and repair of aging aircraft
[AD-A246445] p 3043 N92-27914

AIRCRAFT MANEUVERS
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916

AIRCRAFT MODELS
Progress of magnetic suspension and balance systems for wind tunnels in the USSR p 3053 N92-27803
Development of telemetry for the agility flight test of a radio controlled fighter model
[AD-A248653] p 3055 N92-27994
NACA0012 airfoil data corrected for sidewall boundary-layer effects in the NAL two-dimensional transonic wind tunnel
[NAL-TM-640T] p 3042 N92-28151
Estimation of cable-mounted model inertia characteristics for dynamic wind-tunnel test
[NAL-TM-641] p 3042 N92-28152
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190
A gust generation method for full configuration aircraft tests in a low speed wind tunnel. Part 1: Design and preliminary experiments
[NAL-TR-1115-PT-1] p 3043 N92-28192

AIRCRAFT NOISE
Steady-state acoustical noise measurements in aviation systems
[AD-A247831] p 3162 N92-27924

AIRCRAFT PERFORMANCE
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870

AIRCRAFT PILOTS
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
ICAAS piloted simulation evaluation p 3034 N92-27906

AIRCRAFT RELIABILITY
Estimating the reliability of a system on the basis of sample paths
[AD-A248585] p 3115 N92-28171

AIRCRAFT SAFETY
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750
Human factors evaluation of the work environment of operators engaged in the inspection and repair of aging aircraft
[AD-A246445] p 3043 N92-27914
Avionic data bus integration technology
[DOT/FAA/CT-91/19] p 3047 N92-27973
Composite profiles of helicopter mishaps at heliports and airports
[AD-A248887] p 3043 N92-28052

AIRCRAFT STRUCTURES
A preliminary study on damage detection using piezoelectric film
[AD-A246350] p 3046 N92-28118

AIRCRAFT TIRES
Foreign object damage to tires operating in a wartime environment
[AD-A247195] p 3043 N92-27682

AIRCRAFT WAKES
Trajectories and stability of trailing vortices very near the ground
[NRC-32151] p 3035 N92-27344

AIRFOIL PROFILES
The benchmark aeroelastic models program: Description and highlights of initial results p 3041 N92-27960

AIRFOILS
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
Computations of unsteady flows around airfoil sections by explicit and implicit methods solving the Euler and Navier-Stokes equations p 3039 N92-27948
Further investigation of the effect of model cooling on periodic transonic flow p 3042 N92-27961

AIRGLOW
The observable effects of gravity waves on airglow emissions
[ISBN-0-315-57927-7] p 3127 N92-27620

AIRLINE OPERATIONS
Drag reduction: An industrial challenge p 3036 N92-27708

AIRPORTS
Composite profiles of helicopter mishaps at heliports and airports
[AD-A248887] p 3043 N92-28052

ALFALFA
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert p 3088 N92-28025

ALGEBRA
The multicomputer toolbox approach to concurrent BLAS and LACs
[DE92-010401] p 3146 N92-27391
A procedure for obtaining an algebraic approximation to certain integrals
[AD-A245371] p 3157 N92-27437
Development of an algebraic turbulence model for analysis of propulsion flows
[NASA-TM-105701] p 3157 N92-27517

ALGORITHMS
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382
Data compression and archiving software implementation and their algorithm comparison
[AD-A247853] p 3146 N92-27387
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434
On the computation of unsteady turbomachinery flows. Part 1: Euler equations in vibrating cascades p 3096 N92-27460
Computation and visualization of specific flow phenomena in turbomachinery application p 3050 N92-27463
Unsteady Euler calculations in 3D internal aerodynamics p 3098 N92-27470
Investigation of dynamic algorithms for pattern recognition identified in cerebral cortex
[AD-A247860] p 3139 N92-27512
Implementation notes on bdes(1) --- data encryption implementation
[NASA-CR-190442] p 3147 N92-27560
Experimental validation of clock synchronization algorithms
[NASA-TP-3209] p 3153 N92-27589
A fast, uncoupled, compressible, two-dimensional, unsteady boundary layer algorithm with separation for engine inlets
[NASA-TM-105686] p 3102 N92-27653
Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661
Design of digital signal processing algorithms for enhancing the measurements of ultra-fast electromagnetic transients
[AD-A246269] p 3148 N92-27663
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations p 3103 N92-27677
Finite element methods in CFD: Grid generation, adaptivity, and parallelization p 3103 N92-27679
A frontal approach for node generation in Delaunay triangulations p 3103 N92-27680
Massively parallel computing, C++, and hydrocode algorithms
[DE92-006739] p 3154 N92-27748
Design of bearings for rotor systems based on stability p 3063 N92-27799
An evaluation of some strategies for vibration control of flexible rotors p 3063 N92-27800
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
Distributed ray casting for high-speed volume rendering
[AD-A248167] p 3150 N92-27868
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems
[NASA-CR-186516] p 3116 N92-27874
Comparison of the event-step algorithm to other path planning methods to avoid dynamic 3D obstacles p 3033 N92-27896
Search route planning p 3033 N92-27900
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920
Form error models of the NIST algorithm testing system
[PB92-172014] p 3150 N92-27923
An evolutionary approach to designing neural networks
[AD-A247003] p 3157 N92-27987
Implementation of parallel algorithms
[AD-A248759] p 3150 N92-27995
Soil moisture measurements from airborne SAR p 3120 N92-28020
External calibration of polarimetric radars using point and distributed targets p 3088 N92-28031
Iterative methods for estimation of 2-D AR parameters using a data-adaptive Toeplitz approximation algorithm
[AD-A246009] p 3151 N92-28049
An efficient heuristic scheduler for hard real-time systems
[AD-A247322] p 3152 N92-28169

ALKALINE BATTERIES
Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update
[NASA-TM-105689] p 3067 N92-27878

ALKYL COMPOUNDS
Synthesis and characterization of new poly(alkyl/arylphosphazenes)
[AD-A245380] p 3076 N92-27442

ALLOCATIONS
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222

ALPHA PARTICLES
Investigation of alpha particle induced single-event upsets in charge-coupled devices
[AD-A246268] p 3090 N92-27662

ALPHANUMERIC CHARACTERS
Design and implementation of a multimedia DBMS: Modification and deletion
[AD-A246080] p 3180 N92-27523

ALTERNATING CURRENT
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840

ALTITUDE
Implementations and analysis of foil chaff cloud measurements for the wind field in winter over northern Norway, at 75 up to 100 kilometers height
[BONN-IR-91-15] p 3128 N92-27420

ALUMINUM
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296
The application of chaos theory to an alumina sensor for aluminum reduction cells
[DE92-010630] p 3089 N92-27395
Multiple-wavelength transmission measurements in rocket motor plumes
[AD-A245999] p 3067 N92-27521

The determination of interfacial structure and phase transitions in Al/Cu and Al/Ni interfaces by means of surface extended x ray absorption fine structure
[DE92-009373] p 3074 N92-27913

ALUMINUM ALLOYS
Processing, microstructure and superplasticity in Al-Mg-Mn alloys
[AD-A246488] p 3073 N92-27207
Rheological behavior and microstructure of ceramic particulate/aluminum alloy composites
[NASA-CR-190036] p 3074 N92-27542
Development of the microstructure based stochastic life prediction models
[AD-A246447] p 3074 N92-27821

ALUMINUM CHLORIDES
Lithium rechargeable cell with a polymer cathode
[AD-A247577] p 3090 N92-27567

ALUMINUM NITRIDES
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging
[AD-A246429] p 3088 N92-27204

ALUMINUM OXIDES
The application of chaos theory to an alumina sensor for aluminum reduction cells
[DE92-010630] p 3089 N92-27395
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C
[AD-A247880] p 3071 N92-27514
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C
[AD-A246407] p 3069 N92-27752
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials
[AD-A248736] p 3078 N92-28126

ALVEOLAR AIR
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990

ALVEOLI
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990

AMBIENCE
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247926] p 3125 N92-27846

AMBIGUITY
Scope ambiguity and inference
[AD-A247448] p 3148 N92-27591

AMINES
First, second, and third generation high energy materials from cubane
[AD-A247559] p 3080 N92-27562
Bislactone curing agents for epoxy resins and polymers obtained therefrom
[AD-D015221] p 3077 N92-27618

AMMUNITION
Interdiction mission planning and co-ordination during the Gulf conflict 17 January - 27 February 1991
p 3031 N92-27888

AMORPHOUS MATERIALS
Synthesis and characterization of new poly(alkyl/arylphosphazenes)
[AD-A245380] p 3076 N92-27442
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers
[DE92-010449] p 3069 N92-27856

AMORPHOUS SILICON
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837

AMPLIFICATION
Parasitic free switched capacitor composite operational amplifiers
[AD-A246258] p 3093 N92-28167
Amplification and damping of synchrotron oscillations via a parametric process
[DE92-010748] p 3166 N92-28174

AMPLIFIERS
Amplification and damping of synchrotron oscillations via a parametric process
[DE92-010748] p 3166 N92-28174

ANALOG CIRCUITS
Parasitic free switched capacitor composite operational amplifiers
[AD-A246258] p 3093 N92-28167

ANALYSIS (MATHEMATICS)
The metrics handbook
[AD-A248591] p 3081 N92-28180

ANALYTIC FUNCTIONS
Deformations of complex structures on gamma/SL2(C) and cohomology of local systems p 3161 N92-27556

ANALYZERS
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163

ANDES MOUNTAINS (SOUTH AMERICA)
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada
p 3121 N92-28027

ANGLE OF ATTACK
A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880

ANGULAR DISTRIBUTION
Angular distributions of 5eV atomic oxygen scattered from solid surfaces on the LDEF satellite
p 3165 N92-27301

ANGULAR MOMENTUM
Electromagnetic effects in Saturn's B ring
p 3193 N92-27637

ANISOTROPY
Magneto-optical studies of ultrathin ferromagnetic films
[DE92-010252] p 3176 N92-27345
Fabric-stress-deformation relations in granular materials
[AD-A247009] p 3117 N92-28138

ANNEALING
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122
An XPS study of the formation of thin Pt and Ir silicide overlayers on Si (100) 2 x 1 surfaces
[AD-A245929] p 3178 N92-28165

ANNUAL VARIATIONS
Climatic atlas of seasonal and annual Arctic sea-level pressures, SLP anomalies, and sea-ice concentrations, 1953-1988
[CGCR-91-14] p 3129 N92-27427
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666

ANNULAR DUCTS
Experimental performance of three design factors for ventral nozzles for SSTOVL aircraft
[NASA-TM-105697] p 3049 N92-27669

ANNULAR FLOW
Validation of a CANARI code by the computation of three dimensional turbulent flow in turbine valve
p 3050 N92-27462

ANNULAR SUSPENSION AND POINTING SYSTEM
Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722

ANODIZING
Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296

ANOMALIES
Interpretation of time domain electromagnetic soundings near geological contacts
[DE92-010467] p 3126 N92-27347
Computed tomography analysis of castings
[AD-A249099] p 3074 N92-28053

ANTENNA ARRAYS
Millimeter-wave quasi-optical arrays
[AD-A248456] p 3093 N92-28141

ANTENNA DESIGN
Antenna pointing system mounted on a flexible space structure
[NAL-TR-1119] p 3110 N92-27432

ANTENNA RADIATION PATTERNS
Integrated multi-domain radar demonstration
[AD-A246653] p 3084 N92-27758

ANTENNAS
Evaluation of method of moments codes: University of Houston junction and numerical electromagnetic code
[AD-A247570] p 3083 N92-27565

ANTHROPOMETRY
Development of a standard anthropometric dimension set for use in computer-aided glove design
[AD-A246272] p 3143 N92-27664

ANTIFRICTION BEARINGS
An assessment of the economic status of the antifriction bearing industry
[AD-A245373] p 3110 N92-27439

ANTIPROTONS
Bose-Einstein correlations in proton-antiproton collisions at square root of s equals 200 to 900 GeV
[ISBN-0-315-50129-4] p 3164 N92-27691

ANTIREFLECTION COATINGS
Effects of long term space environment exposure on optical substrates and coatings (S0050-2)
p 3170 N92-27310

ANXIETY
Stress-induced enhancement of the startle reflex
[AD-A247096] p 3140 N92-27839

APPLICATIONS PROGRAMS (COMPUTERS)
Alternatives for developing user documentation for applications software
[AD-A247248] p 3145 N92-27215
HippoDraw and Hippoplotamus
[DE92-010744] p 3146 N92-27414
An approach to integration of real-time software for an autonomous underwater vehicle
[AD-A245377] p 3154 N92-27441
Pascal software for CO2-Laserradar ranging with a HP9000 computer
[AD-A245383] p 3108 N92-27443
Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552
Calculation of turbulent reactive flows in general orthogonal coordinates
[NRC-32128] p 3104 N92-27693
Application driven interface generation for EASIE
p 3145 N92-27832
Generating the complete control environment interface for EASIE p 3150 N92-27833
Form error models of the NIST algorithm testing system
[PB92-172014] p 3150 N92-27923
The AIRSAR image browse system
p 3088 N92-28034

APPROACH AND LANDING TESTS (STS)
Note on flight measured control effectiveness of the quiet STOL experimental aircraft ASKA
[NAL-TR-1103] p 3051 N92-28154
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191

APPROXIMATION
Iterative methods for estimation of 2-D AR parameters using a data-adaptive Toeplitz approximation algorithm
[AD-A246009] p 3151 N92-28049
Mathematical and numerical analysis aspects of quasi-neural networks
[AD-A248583] p 3158 N92-28061

AQUEOUS SOLUTIONS
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120

ARC SPRAYING
Plasma spray technology process parameters and applications
[DE92-620035] p 3078 N92-28159

ARC WELDING
Shielded metal arc welding consumables for advanced high strength steels
[AD-A247005] p 3075 N92-28136

ARCHITECTURE (COMPUTERS)
Local Area Network (LAN) compatibility issues
[AD-A247249] p 3153 N92-27212
An information systems architecture analysis for Naval Air Systems Command
[AD-A247787] p 3184 N92-27885
Technology and standards for a common air mission planner p 3033 N92-27899
Parallel knowledge based systems architectures for in-flight mission management p 3034 N92-27904
Core avionics and standardization
[AD-A248326] p 3047 N92-27925
Implementation of parallel algorithms
[AD-A248759] p 3150 N92-27995
High speed local area networks p 3086 N92-28087

ARCTIC OCEAN
Sensitivity study of a dynamic thermodynamic sea-ice model
[CGCR-91-22] p 3132 N92-27370
Climatic atlas of seasonal and annual Arctic sea-level pressures, SLP anomalies, and sea-ice concentrations, 1953-1988
[CGCR-91-14] p 3129 N92-27427
Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-91-17] p 3133 N92-27547

Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-90-10] p 3133 N92-27548

ARCTIC REGIONS

Current and future trends in Arctic climate research: Can changes of the Arctic sea ice be used as an early indicator of global warming?
[CGCR-91-1] p 3131 N92-27340

Climatic atlas of seasonal sea-level pressure and sea-ice concentration in the Hudson Bay-Baffin Bay-Labrador Sea region, 1953-1988
[CGCR-91-5] p 3132 N92-27342

Interannual variability of sea-level pressure, sea-ice, and runoff over the Arctic
[CGCR-91-6] p 3132 N92-27356

Modelling solar radiation in the Arctic: An improved method for the subdivision of global radiation
[AD-A246271] p 3194 N92-27818

ARGON

Investigation of an argon-filled thermoacoustic prime mover
[AD-A246751] p 3179 N92-28107

ARMED FORCES (UNITED STATES)

STAR 21: Strategic technologies for the Army of the twenty-first century
[REPT-92-8945] p 3160 N92-27423

A meta-analysis of pilot selection tests: Success and performance in pilot training
[AD-A246623] p 3140 N92-27537

United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 13: Wright Laboratory
[AD-A248776] p 3218 N92-28078

United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 9: Wright Laboratory
[AD-A248772] p 3218 N92-28096

United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) repoorts. Volume 10: Armstrong Laboratory
[AD-A248773] p 3218 N92-28097

United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 11: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248774] p 3219 N92-28098

United States Air Force Summer Research program 1991. High School Apprenticeship Program (HSAP) reports. Volume 12: Rome Laboratory, Arnold Engineering Development Center
[AD-A248775] p 3219 N92-28099

United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 6: Armstrong Laboratory, Wilford Hall Medical Center
[AD-A248769] p 3219 N92-28109

United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 7: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248770] p 3219 N92-28110

United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 8: Rome Laboratory, Arnold Engineering Development Center, F. J. Seiler Research Laboratory
[AD-A248771] p 3219 N92-28111

United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5A: Wright Laboratory
[AD-A248767] p 3219 N92-28127

United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5B: Wright Laboratory
[AD-A248768] p 3219 N92-28128

ARRAYS

Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328

Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908

ARTIFICIAL INTELLIGENCE

Integrated multi-domain radar demonstration
[AD-A246653] p 3084 N92-27758

A teamwork model of pilot aiding: Psychological principles for mission management systems design
p 3032 N92-27893

ARTIFICIAL SATELLITES

NAVSPASUR sensor performance study
[AD-A246592] p 3082 N92-27503

Conference on Combined Effects: Radiation, Microg ravity, Trauma, and other Factors
[AD-A247799] p 3065 N92-27862

Fuzzy guidance system evaluation
p 3034 N92-27903

ASPECT RATIO

Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios
[AD-A246057] p 3104 N92-27828

ASSIMILATION

Assimilation modeling of coastal transition zone data and continental slope flow fields
[AD-A248692] p 3135 N92-28010

ASTEROIDS

Asteroidal versus cometary meteoroid impacts on the Long Duration Exposure Facility (LDEF)
p 3193 N92-27263

ASTRODYNAMICS

Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594

ASTRONOMICAL CATALOGS

Clustering of faint galaxies
[ISBN-0-315-53743-4] p 3189 N92-27686

ASTRONOMICAL MODELS

Topics in galactic dynamics
[ISBN-0-315-47774-1] p 3190 N92-27611

Birth of universes with non-minimal coupling
[ISBN-0-315-55826-1] p 3190 N92-27623

Autogravity waves in a polytropic layer
p 3195 N92-27635

Fluctuations for galaxy formation from inflation models
[ISBN-0-315-54662-X] p 3191 N92-27690

Self-similar spiral structure in astrophysical disks
[ISBN-0-315-61539-7] p 3191 N92-27701

ASTRONOMICAL SATELLITES

Gamma astronomy satellite p 3053 N92-27932

ASTRONOMY

SPAN: Astronomy and astrophysics
[NASA-TM-107940] p 3192 N92-28185

ASTROPHYSICS

SPAN: Astronomy and astrophysics
[NASA-TM-107940] p 3192 N92-28185

ASYMPTOTIC PROPERTIES

Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661

ATLANTIC OCEAN

Seasonal, monthly, and annual reports of ocean weather stations: Anomaly time series of surface heat budget parameters
[CGCR-91-3] p 3131 N92-27341

The effect of latent heat release on the ERICA IOP-5 cyclone
[AD-A245779] p 3130 N92-27912

ATMOSPHERIC BOUNDARY LAYER

Modeling and observational studies of mesoscale air-mass boundaries and warm-season convective precipitation
[AD-A247030] p 3128 N92-27336

Navy Atmospheric Boundary Layer (NABL) model system: Software/Interface requirements specification
[AD-A247501] p 3127 N92-27922

An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168

ATMOSPHERIC CHEMISTRY

Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047

ATMOSPHERIC CIRCULATION

ARM review, 1991
[AD-A247629] p 3125 N92-27511

Coastally trapped disturbances in the lower atmosphere
[ISBN-0-315-55186-0] p 3129 N92-27622

Persistent circulation anomalies in observations and in a general circulation model
[ISBN-0-315-57198-5] p 3127 N92-27642

Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696

ATMOSPHERIC COMPOSITION

Sensitivity of global warming potentials to the assumed background atmosphere
[DE92-011072] p 3124 N92-27417

ATMOSPHERIC EFFECTS

Laboratory measurements of the transmission and scattering of laser beams in optically dense clouds
[ISBN-0-315-58085-2] p 3108 N92-27647

ATMOSPHERIC GENERAL CIRCULATION MODELS

NSERC/AES Industrial Research Chairs in climate research, McGill University
[CRG-89-4] p 3124 N92-27343

ATMOSPHERIC HEATING

The effect of latent heat release on the ERICA IOP-5 cyclone
[AD-A245779] p 3130 N92-27912

ATMOSPHERIC MODELS

Wave-wave interactions in a steady-state stratospheric model, part 1
[CRG-89-5-PT-1] p 3126 N92-27355

Review of climatic fluctuations on the century timescale
[CGCR-89-7] p 3124 N92-27426

ARM review, 1991
[AD-A247629] p 3125 N92-27511

Monthly mean sea ice data from the polar ice prediction system, the regional polar ice prediction system (Barents Sea), and the regional polar ice prediction system (Greenland Sea)
[AD-A246145] p 3134 N92-27574

Persistent circulation anomalies in observations and in a general circulation model
[ISBN-0-315-57198-5] p 3127 N92-27642

The NOGAPS forecast model: A technical description
[AD-A247216] p 3130 N92-27842

Navy Atmospheric Boundary Layer (NABL) model system: Software/Interface requirements specification
[AD-A247501] p 3127 N92-27922

Global climate change and international security
[DE92-010868] p 3125 N92-28056

An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168

AES/NSERC Industrial Research Chairs (IRC) in climate research
[CGCR-91-9] p 3125 N92-28200

Wave-wave interactions in a steady-state stratospheric model, part 2
[CRG-89-6-PT-2] p 3128 N92-28201

ATMOSPHERIC PHYSICS

Navy Atmospheric Boundary Layer (NABL) model system: Software/Interface requirements specification
[AD-A247501] p 3127 N92-27922

SPAN: Ocean science
[NASA-TM-107939] p 3187 N92-28186

Management of the Space Physics Analysis Network (SPAN)
[NASA-TM-107934] p 3187 N92-28188

ATMOSPHERIC PRESSURE

Climatic atlas of seasonal sea-level pressure and sea-ice concentration in the Hudson Bay-Baffin Bay-Labrador Sea region, 1953-1988
[CGCR-91-5] p 3132 N92-27342

Interannual variability of sea-level pressure, sea-ice, and runoff over the Arctic
[CGCR-91-6] p 3132 N92-27356

Climatic atlas of the Northern Hemisphere seasonal and annual mean sea-level pressures, 1952-1987
[CGCR-90-17] p 3128 N92-27425

ATMOSPHERIC RADIATION

Small satellites and RPAs in global-change research, summary and conclusions
[AD-A247855] p 3055 N92-27388

ARM review, 1991
[AD-A247629] p 3125 N92-27511

ATMOSPHERIC SCATTERING

The design, development, and test of balloonborne and groundbased lidar systems. Volume 2: Flight test of Atmospheric Balloon Lidar Experiment, ABLE 2
[AD-A246727] p 3087 N92-28103

ATMOSPHERIC TEMPERATURE

Oxygen isotopes implanted in the LDEF spacecraft
p 3165 N92-27284

An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168

ATMOSPHERIC TURBULENCE

The modelling of turbulence and downbursts for flight simulators
[ISBN-0-315-59945-6] p 3051 N92-27645

ATMOSPHERICS

Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696

ATOMIC BEAMS

Nonlinear optics in dense frequency narrow supersonic beams
[AD-A246647] p 3168 N92-27756

ATOMIC INTERACTIONS

Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008

ATOMIC STRUCTURE

Theory of semiconducting superlattices and microstructures
[AD-A248681] p 3092 N92-27965

ATOMS

Nanophase materials assembled from clusters
[DE92-010508] p 3076 N92-27412

Fluctuations and squeezing in resonance fluorescence emitted near a phase conjugator
[AD-A248735] p 3170 N92-28125

ATTACK AIRCRAFT

Situation assessment in the Paladin tactical decision generation system p 3032 N92-27892

ATTENTION
What and where in visual attention: Evidence from the neglect syndrome
[AD-A246932] p 3139 N92-27509
Visual attention and perception in three-dimensional space
[AD-A247823] p 3141 N92-27910
Reference frames in vision
[AD-A248743] p 3138 N92-27968
Visual perception of features and objects
[AD-A248578] p 3142 N92-28170
Visual processing in texture segregation
[AD-A247173] p 3142 N92-28176

ATTENUATION
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields
p 3060 N92-27746

ATTITUDE (INCLINATION)
Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210

ATTITUDE CONTROL
Development of an active damping system to aid in the attitude control of flexible spacecraft
[AD-A246248] p 3050 N92-27200
Attitude stability of LDEF: Refinement of results from the silver pinhole camera p 3066 N92-27219
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809
Fuzzy guidance system evaluation
p 3034 N92-27903
Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210

ATTITUDE INDICATORS
Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210

ATTITUDE STABILITY
Attitude stability of LDEF: Refinement of results from the silver pinhole camera p 3066 N92-27219
Pitch-heave dynamics models for an air cushion vehicle
[ISBN-0-315-51095-1] p 3036 N92-27624

AUDIO DATA
Design and implementation of a multimedia DBMS: Modification and deletion
[AD-A246080] p 3180 N92-27523

AUDITORY PERCEPTION
Narrowband and broadband envelope cues for aural classification
[AD-A248693] p 3163 N92-28011

AURORAS
Activities, accomplishments and research progress of the Center for Theoretical Geoplasma Physics, Center for Space Research, Massachusetts Inst. of Technology
[AD-A248572] p 3127 N92-27963

AUTOMATIC CONTROL
Automated generation of three-dimensional virtual worlds for task explanation
[AD-A247859] p 3154 N92-27389
Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
Automated assembly of large space structures
p 3156 N92-27774
Future work in automated assembly of large space structures p 3156 N92-27779
The concept of the mechanically active guideway as a novel approach to maglev p 3064 N92-27807
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles
p 3031 N92-27890
From an automated flight-test management system to a flight-test engineer's workstation p 3035 N92-27907
Integrity in automated information systems
[AD-A245555] p 3185 N92-28040

AUTOMATIC PILOTS
Flight-determined benefits of integrated flight-propulsion control systems
[NASA-TM-4393] p 3048 N92-27587

AUTONOMOUS NAVIGATION
An approach to integration of real-time software for an autonomous underwater vehicle
[AD-A245377] p 3154 N92-27441
Autonomous planetary rover
[NASA-CR-190465] p 3173 N92-27866

AUXILIARY POWER SOURCES
DC uninterrupted power supply having instantaneous switching followed by low impedance switching
[AD-D015206] p 3089 N92-27398

AVIATION METEOROLOGY
Experimental evaluation of candidate graphical microburst alert displays
[NASA-CR-189633] p 3047 N92-27424

AVIATION PSYCHOLOGY
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518

AVIONICS
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant
p 3032 N92-27895
ICAAS piloted simulation evaluation
p 3034 N92-27906
Core avionics and standardization
[AD-A248326] p 3047 N92-27925
Avionic data bus integration technology
[DOT/FAA/CT-91/19] p 3047 N92-27973

AXIAL FLOW TURBINES
Users manual and modeling improvements for axial turbine design and performance computer code TD2-2
[NASA-CR-189118] p 3035 N92-27376
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade
p 3095 N92-27457

AXISYMMETRIC FLOW
Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483

AZIDES (INORGANIC)
The relevance of the DeBroglie velocity (V1 = h/2md1) to shock loading induced reactions in lead azide
[AD-A246478] p 3177 N92-27607

AZIDES (ORGANIC)
The relevance of the DeBroglie velocity (V1 = h/2md1) to shock loading induced reactions in lead azide
[AD-A246478] p 3177 N92-27607

B

BACKGROUND RADIATION
Analysis of the possibilities of suppression of the cosmic-ray background when detecting very high energy cosmic gamma quanta by means of a system of Cherenkov gamma telescopes with multichannel light receivers
[DE92-620916] p 3195 N92-27493
Development of voids in the thin-wall approximation
[ISBN-0-315-60772-6] p 3191 N92-27689

BACKSCATTERING
The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery
p 3119 N92-28015
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site
p 3120 N92-28018
The design, development, and test of balloonborne and groundbased lidar systems. Volume 2: Flight test of Atmospheric Balloon Lidar Experiment, ABLE 2
[AD-A246727] p 3087 N92-28103

BACKWARD FACING STEPS
An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399

BAFFLES
Advanced baffle materials technology development
[AD-A247935] p 3169 N92-27826

BALANCE
Present status of the MIT/NASA Langley 6-inch MSBS p 3053 N92-27802
Progress of magnetic suspension and balance systems for wind tunnels in the USSR p 3053 N92-27803

BALL BEARINGS
Computer graphics for bearing dynamic analysis
[AD-A247567] p 3148 N92-27584

BALLOON FLIGHT
Small balloon ballistic tracing and behavior anomalies
[AD-A247435] p 3130 N92-27845

BALLOON-BORNE INSTRUMENTS
The design, development, and test of balloonborne and groundbased lidar systems. Volume 2: Flight test of Atmospheric Balloon Lidar Experiment, ABLE 2
[AD-A246727] p 3087 N92-28103

BALLOONING MODES
Stability of long wavelength modes in tokamaks
[PPL-117] p 3172 N92-27448
Ballooning and drift-Alfven modes in tokamaks
[PPL-104] p 3174 N92-28195
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-108] p 3175 N92-28196
Local kinetic analysis of the ballooning mode in tokamaks
[PPL-111] p 3175 N92-28197
Electromagnetic and kinetic effects on the ion temperature gradient mode
[PPL-113] p 3175 N92-28198
Microballooning mode in tokamaks
[PPL-107] p 3175 N92-28205

BANDSTOP FILTERS
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785

BANDWIDTH
Optically stable, large time bandwidth acousto-optic heterodyne spectrum analyzer with fixed non-zero heterodyne output
[AD-D015223] p 3163 N92-27998

BARIUM COMPOUNDS
Levitation of YBa2Cu3O(7-x) superconductor in a variable magnetic field p 3059 N92-27735

BARIUM OXIDES
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012
Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials
[AD-A248736] p 3078 N92-28126
High performance YBCO films
[AD-A246802] p 3093 N92-28130

BAROCLINITY
Assimilation modeling of coastal transition zone data and continental slope flow fields
[AD-A248692] p 3135 N92-28010

BAROTROPISM
Assimilation modeling of coastal transition zone data and continental slope flow fields
[AD-A248692] p 3135 N92-28010

BARRED GALAXIES
Topics in galactic dynamics
[ISBN-0-315-47774-1] p 3190 N92-27611

BARRIER LAYERS
Heterostructure device useable as a far infrared photodetector — semiconductor devices
[AD-D015217] p 3168 N92-27616

BASE PRESSURE
Progress of magnetic suspension and balance systems for wind tunnels in the USSR p 3053 N92-27803

BATTERY CHARGERS
DC uninterrupted power supply having instantaneous switching followed by low impedance switching
[AD-D015206] p 3089 N92-27398

BAYES THEOREM
Reconstruction based on flexible prior models
[DE92-011263] p 3118 N92-28214

BAYS (STRUCTURAL UNITS)
An analysis of fixed wing tactical airlifter characteristics using an intra-theater airlift computer model
[AD-A246908] p 3045 N92-27719

BAYS (TOPOGRAPHIC FEATURES)
Evaluation of absolute positioning using the Defense Mapping Agency's (GASP) program
[AD-A246818] p 3044 N92-28133

BEAM INTERACTIONS
Simulation of tail distributions in electron-positron circular colliders
[DE92-010743] p 3166 N92-27413
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047
Amplification and damping of synchrotron oscillations via a parametric process
[DE92-010748] p 3166 N92-28174

BEAMS (RADIATION)
Simulation of tail distributions in electron-positron circular colliders
[DE92-010743] p 3166 N92-27413

BEARING (DIRECTION)
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916

BEARINGLESS ROTORS
The bearingless electrical machine
p 3061 N92-27793

BEARINGS
An experimental study of a small high speed LH2 rocket pump: A suppression method of asynchronous shaft vibrations
[NAL-TR-1118] p 3110 N92-27431
Effect of flux penetration on the load capacity of passive superconducting bearings p 3061 N92-27790

BEAUFORT SEA (NORTH AMERICA)
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247928] p 3125 N92-27846

BERYLLIUM ISOTOPES
Criticality of Be-7 concentration in LDEF
p 3165 N92-27238
Cosmogenic radioisotopes on LDEF surfaces
p 3165 N92-27239
BERYLLIUM OXIDES
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging
[AD-A246429] p 3088 N92-27204
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C
[AD-A247880] p 3071 N92-27514
BIAS
A Cramer-Rao type lower bound for essentially unbiased parameter estimation
[AD-A246666] p 3160 N92-27915
The influence of subject expectation on visual accommodation in the dark
[AD-A245923] p 3142 N92-28164
BIBLIOGRAPHIES
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 361)
[NASA-SP-7011(361)] p 3137 N92-27433
Aeronautical engineering: A continuing bibliography with indexes (supplement 277)
[NASA-SP-7037(277)] p 3035 N92-27929
Dredging research program: Global positioning system bibliography
[AD-A248954] p 3044 N92-28079
AES/NSERC Industrial Research Chairs (IRC) in climate research
[CGCR-91-9] p 3125 N92-28200
BIG BANG COSMOLOGY
Birth of universes with non-minimal coupling
[ISBN-0-315-55826-1] p 3190 N92-27623
Development of voids in the thin-wall approximation
[ISBN-0-315-60772-6] p 3191 N92-27689
Fluctuations for galaxy formation from inflation models
[ISBN-0-315-54662-X] p 3191 N92-27690
BINDERS (MATERIALS)
Characterization of powder coated thermoplastic composite
[AD-A247230] p 3068 N92-27383
BIOACOUSTICS
Software tools for acoustic database management
[AD-A247636] p 3181 N92-27553
BIOASTRONAUTICS
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 361)
[NASA-SP-7011(361)] p 3137 N92-27433
BIOLOGICAL EFFECTS
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 361)
[NASA-SP-7011(361)] p 3137 N92-27433
The effects of hydrazines on neuronal excitability
[AD-A247103] p 3137 N92-27844
BIOMASS
The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery
p 3119 N92-28015
BIT ERROR RATE
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
BLACKOUT (PHYSIOLOGY)
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371
BLACKOUT PREVENTION
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 3
[CTN-92-60539] p 3143 N92-27358
BLADE-VORTEX INTERACTION
A gust generation method for full configuration aircraft tests in a low speed wind tunnel. Part 1: Design and preliminary experiments
[NAL-TR-1115-PT-1] p 3043 N92-28192
BLOOD PRESSURE
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 3
[CTN-92-60539] p 3143 N92-27358
BODIES OF REVOLUTION
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream
p 3039 N92-27946
BODY TEMPERATURE
Arterio-venous anastomoses and thermoregulation
[AD-A245385] p 3137 N92-27361
BODY-WING CONFIGURATIONS
Pressure-based high-order TVD methodology for dynamic stall control
[AD-A247056] p 3105 N92-27918
BOILERS
Active magnetic bearings: As applied to centrifugal pumps p 3057 N92-27726
BOMBARDMENT
Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008
BORON
The structure and reactivity of boron surfaces
[AD-A247265] p 3071 N92-27510
BOSONS
The Cornwall-Norton model in the strong coupling regime
[DE92-621061] p 3164 N92-27498
BOUNDARIES
A frontal approach for node generation in Delaunay triangulations p 3103 N92-27680
BOUNDARY CONDITIONS
A generalized approach to the thermal analysis of the Long Duration Exposure Facility's flight experiments
p 3179 N92-27221
A mathematical constraint placed upon inter-blade row boundary conditions used in the simulation of multistage turbomachinery flows p 3095 N92-27458
Three dimensional solution of internal flows using a cell vertex finite volume method p 3098 N92-27473
BOUNDARY INTEGRAL METHOD
A boundary integral formulation for unsteady transonic potential flows p 3038 N92-27942
BOUNDARY LAYER CONTROL
Special Course on Skin Friction Drag Reduction
[AGARD-R-786] p 3036 N92-27706
Basic concepts on boundary layers
p 3036 N92-27707
Aircraft drag reduction p 3036 N92-27709
Laminar-turbulent transition: Fundamentals
p 3036 N92-27710
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
Evaluation of high lift devices of the quiet STOL experimental aircraft ASKA
[NAL-TR-1102] p 3046 N92-28153
BOUNDARY LAYER FLOW
NACA0012 airfoil data corrected for sidewall boundary-layer effects in the NAL two-dimensional transonic wind tunnel
[NAL-TM-640T] p 3042 N92-28151
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168
Steady and transient analysis of flows exhibiting strong viscous/inviscid interaction (Composite RNS procedures)
[AD-A247171] p 3105 N92-28175
BOUNDARY LAYER SEPARATION
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
Aircraft drag reduction p 3036 N92-27709
Steady and transient analysis of flows exhibiting strong viscous/inviscid interaction (Composite RNS procedures)
[AD-A247171] p 3105 N92-28175
BOUNDARY LAYER STABILITY
Laminar-turbulent transition: Fundamentals
p 3036 N92-27710
BOUNDARY LAYER TRANSITION
Turbulent heat flux measurements in a transitional boundary layer
[NASA-TM-105623] p 3035 N92-27377
Basic concepts on boundary layers
p 3036 N92-27707
Laminar-turbulent transition: Fundamentals
p 3036 N92-27710
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711
The eddy structures in bounded shear flows
p 3037 N92-27712
The FML compressor as a drive system for the LFSWT: A narrative p 3052 N92-27978
BOUNDARY LAYERS
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
The eddy structures in bounded shear flows
p 3037 N92-27712
A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880
BOUNDARY LUBRICATION
Tribological behavior of oil-lubricated, TiN-coated steel
[DE92-010500] p 3110 N92-27410
BOUNDARY VALUE PROBLEMS
Boundary value problems on S(exp n) for surfaces of constant Gauss curvature
[PB92-134410] p 3158 N92-27909
BRAGG CELLS
Optically stable, large time bandwidth acousto-optic heterodyne spectrum analyzer with fixed non-zero heterodyne output
[AD-D015223] p 3163 N92-27998
BRAIN
Fourth conference on the neurobiology of learning and memory
[AD-A247174] p 3140 N92-27538
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050
BREWSTER ANGLE
A comparison of the measured and modelled effects of brewster angle anisotropies upon pulsed XeCl excimer laser output
[ISBN-0-315-49569-3] p 3109 N92-27698
BRIGHTNESS
Effects of color vision deficiency on detection of color-highlighted targets in a simulated air traffic control display
[AD-A246586] p 3139 N92-27500
BROADBAND
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785
Advanced tactical aircraft early risk reduction phase 1 broad band IR window study
[AD-A246633] p 3046 N92-27982
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data
[AD-A248377] p 3085 N92-28003
Narrowband and broadband envelope cues for aural classification
[AD-A248693] p 3163 N92-28011
BROKEN SYMMETRY
Estimation of oblique electroweak corrections
[DE92-010742] p 3179 N92-28160
BUFFER STORAGE
An expert system for measuring, interpreting, and managing system performance factors for the work information management system
[AD-A246878] p 3182 N92-27824
BUILDINGS
UHF television reception: Ghost images from very large buildings
[BBC-RD-1992/1] p 3087 N92-28100
BULKHEADS
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages
p 3149 N92-27831
BUNCHING
Simulation of tail distributions in electron-positron circular colliders
[DE92-010743] p 3166 N92-27413
BURAN SPACE SHUTTLE
Project MAKS air-launched spaceplane
p 3053 N92-27934

C

C BAND
Integrated multi-domain radar demonstration
[AD-A246653] p 3084 N92-27758
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019
Dual frequency along-track interferometry
p 3088 N92-28024
C++ (PROGRAMMING LANGUAGE)
Massively parallel computing, C++, and hydrocode algorithms
[DE92-006739] p 3154 N92-27748
CABLES (ROPES)
Estimation of cable-mounted model inertia characteristics for dynamic wind-tunnel test
[NAL-TM-641] p 3042 N92-28152
CALCIUM
New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876
CALCIUM COMPOUNDS
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C
[AD-A247880] p 3071 N92-27514
CALIBRATING
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data
[AD-A248377] p 3085 N92-28003
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023
MAESTRO1 data set calibration: The JRC approach
p 3122 N92-28028
SAR calibration and principal component analysis
p 3088 N92-28029

Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030
External calibration of polarimetric radars using point and distributed targets p 3088 N92-28031
Calibration of a polarimetric imaging SAR p 3088 N92-28032
Comparison of unconstrained and constrained calibration methods [AD-A246941] p 3111 N92-28074

CALORIMETERS
Tritium measurement technique using in-bed calorimetry [DE92-010061] p 3079 N92-27363

CANADIAN SPACE PROGRAM
The Canadian Space Agency, Space Station, Strategic Technologies for Automation and Robotics Program technology development activity in protection of materials from the low Earth orbit space environment p 3053 N92-27327

CANCER
The carcinogenic risks of low-LET and high-LET ionizing radiations [DE92-010477] p 3136 N92-27349

CANONICAL FORMS
A simple example of modeling hybrid systems using bialgebras: Preliminary version [NASA-CR-190331] p 3157 N92-27557

CANOPIES (VEGETATION)
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan p 3119 N92-28017

CANTILEVER BEAMS
Silicon-on-insulator photonics [AD-A247957] p 3091 N92-27847

CAPACITANCE
A self-zeroing capacitance probe for water wave measurements [NASA-RP-1278] p 3135 N92-27930
Low capacitance field emitter array and method of manufacture therefor [AD-D015225] p 3092 N92-28000

CAPACITANCE-VOLTAGE CHARACTERISTICS
High speed interdigital MSM photodiodes [ISBN-0-315-57980-3] p 3090 N92-27639

CAPACITORS
Investigation of battery charged capacitor pulsed power systems for electromagnetic launcher experiments [AD-A247325] p 3089 N92-27353
Parasitic free switched capacitor composite operational amplifiers [AD-A246258] p 3093 N92-28167

CAPE KENNEDY LAUNCH COMPLEX
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data [AD-A248377] p 3085 N92-28003

CAPTURE EFFECT
Induced activation study of LDEF p 3164 N92-27228

CARBON
Characterization of semi-insulating gallium arsenide [AD-A246511] p 3177 N92-27632
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer [AD-A248164] p 3077 N92-27867

CARBON DIOXIDE
Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region [AD-A248612] p 3072 N92-28064
Inspired gas composition influences recovery from experimental venous air embolism [AD-A247004] p 3138 N92-28135

CARBON DIOXIDE LASERS
Pascal software for CO2-Laserradar ranging with a HP9000 computer [AD-A245383] p 3108 N92-27443
A study of the gas-phase chemistry of solid propellant ingredients using CO2 laser heating [AD-A246510] p 3080 N92-27631
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers [AD-A246037] p 3108 N92-27657

CARBON FIBER REINFORCED PLASTICS
Evaluation of long-duration exposure to the natural space environment on the mechanical properties of carbon-reinforced epoxy and polyimide composites p 3070 N92-27291

CARBON FIBERS
Surface analyses of composites exposed to the space environment on LDEF p 3070 N92-27293
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer [AD-A248164] p 3077 N92-27867

CARBON ISOTOPES
Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region [AD-A248612] p 3072 N92-28064

CARBON MONOXIDE
Propulsion systems using in situ propellants for a Mars ascent vehicle [NASA-TM-105741] p 3067 N92-27654
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance [AD-A247298] p 3143 N92-27990

CARBON STEELS
Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318 [DE92-009408] p 3117 N92-28041

CARBON 14
Cosmogenic radioisotopes on LDEF surfaces p 3165 N92-27239

CARBOXYLATES
Precomplexation and activation of carboxylate and phosphate esters [AD-A247778] p 3077 N92-27704

CARCINOGENS
The carcinogenic risks of low-LET and high-LET ionizing radiations [DE92-010477] p 3136 N92-27349

CARDIOVASCULAR SYSTEM
Arterio-venous anastomoses and thermoregulation [AD-A245385] p 3137 N92-27361

CARGO
Project UM-HAUL (UnManned Heavy pAyload Unloader and Lander): The design of a reusable lunar lander with an independent cargo unloader [NASA-CR-189971] p 3054 N92-27540
An analysis of fixed wing tactical airlifter characteristics using an intra-theater airlift computer model [AD-A246908] p 3045 N92-27719
Project MAKS air-launched spaceplane p 3053 N92-27934

CARRIAGES
Cryogenic test rig with an aerodynamic magnetically levitated carriage p 3052 N92-27792

CARTRIDGES
Electrically actuated multiple store launcher [AD-D015247] p 3054 N92-27374

CASCADE FLOW
A computational study of tip leakage flow and losses in a linear turbine cascade p 3095 N92-27453
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade p 3095 N92-27457
Validation of a CANARI code by the computation of three dimensional turbulent flow in turbine valve p 3050 N92-27462
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation p 3039 N92-27944

CASTING
Computed tomography analysis of castings [AD-A249099] p 3074 N92-28053

CASTINGS
Computed tomography analysis of castings [AD-A249099] p 3074 N92-28053

CATACLYSMIC VARIABLES
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636

CATALOGS (PUBLICATIONS)
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data [AD-A248377] p 3085 N92-28003

CATALYSIS
Macrocycles containing tin [AD-A246866] p 3163 N92-27351
Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update [NASA-TM-105689] p 3067 N92-27878
Vibrational spectroscopic studies of surface chemical interactions in chemisorption and catalysis [DE92-011189] p 3072 N92-28046

CATECHOLAMINE
Strategies to sustain and enhance performance in stressful environments [AD-A247197] p 3141 N92-28094

CAUCHY PROBLEM
Multidimensional upwind methods for unstructured grids p 3102 N92-27675

CELESTIAL NAVIGATION
Visual photometric experiment data processing system [AD-A248657] p 3044 N92-27964

CELL CATHODES
Lithium rechargeable cell with a polymer cathode [AD-A247577] p 3090 N92-27567

CENTRIFUGAL FORCE
Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios [AD-A246057] p 3104 N92-27828

CENTRIFUGAL PUMPS
Calculation by the finite element method of 3-D turbulent flow in a centrifugal pump p 3097 N92-27465
Active magnetic bearings: As applied to centrifugal pumps p 3057 N92-27726

CENTRIFUGES
Geotechnical centrifuge use at University of Cambridge Geotechnical Centre, August-September 1991 [AD-A246490] p 3126 N92-27209
Professor Jesse W. Beams and the first practical magnetic suspension p 3057 N92-27723

CERAMIC COATINGS
High temperature silicide protective coating slurry [AD-D015194] p 3076 N92-27491

CERAMIC FIBERS
Ceramic composites: Enabling aerospace materials [NASA-TM-105599] p 3076 N92-27378
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers [DE92-010449] p 3069 N92-27856

CERAMIC MATRIX COMPOSITES
Ceramic composites: Enabling aerospace materials [NASA-TM-105599] p 3076 N92-27378
Rheological behavior and microstructure of ceramic particulate/aluminum alloy composites [NASA-CR-190036] p 3074 N92-27542
Advanced materials for turbomachinery. Technical memo number 2: Advanced materials compatibility with storable propellants (monomethyl hydrazine and nitrogen tetroxide) [AD-A246725] p 3080 N92-28070

CERAMICS
Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247
Finite element analysis of monolithic solid oxide fuel cells [DE92-010515] p 3123 N92-27392
Nanophase materials assembled from clusters [DE92-010508] p 3076 N92-27412
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C [AD-A247880] p 3071 N92-27514
IMI: In partnership with industry [CTN-92-60490] p 3068 N92-27614
Industrial Materials Institute [CTN-92-60488] p 3068 N92-27650
Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C [AD-A246407] p 3069 N92-27752
Application of ceramic superconductors in high speed turbines p 3061 N92-27791
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives [AD-A248738] p 3077 N92-27966

CEREBRAL CORTEX
Investigation of dynamic algorithms for pattern recognition identified in cerebral cortex [AD-A247860] p 3139 N92-27512

CERTIFICATION
A proactive password checker [NASA-CR-190438] p 3148 N92-27626

CHANNEL FLOW
Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios [AD-A246057] p 3104 N92-27828

CHANNEL NOISE
Performance of a fast frequency-hopped noncoherent MFSK receiver with ratio-statistic combining over Rician fading channels with partial-band interference [AD-A247034] p 3082 N92-27339
ALE frequency selection for Navy modems: Analysis [AD-A247569] p 3083 N92-27564
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers [AD-A247574] p 3108 N92-27566

CHANNELS (DATA TRANSMISSION)
Design and implementation of a fiber optic token-ring local area network [AD-A245364] p 3167 N92-27435
Avionic data bus integration technology [DOT/FAA/CT-91/19] p 3047 N92-27973
Fiber optic data busses for aircraft p 3048 N92-28093

CHAOS
The application of chaos theory to an alumina sensor for aluminum reduction cells [DE92-010630] p 3089 N92-27395

Future missions studies: Combining Schatten's solar activity prediction model with a chaotic prediction model
[NASA-CR-189865] p 3194 N92-28221
CHARACTER RECOGNITION
Human image understanding
[AD-A247048] p 3140 N92-27825
CHARGE CARRIERS
Heterostructure device useable as a far infrared photodetector --- semiconductor devices
[AD-D015217] p 3168 N92-27616
CHARGE COUPLED DEVICES
Investigation of alpha particle induced single-event upsets in charge-coupled devices
[AD-A246268] p 3090 N92-27662
CHARGE DISTRIBUTION
Study of the charge and energy distributions of low-energy particles of cosmic radiation in the near-earth orbit by the method of controllable nuclear emulsion
[DE92-620924] p 3195 N92-27494
CHARGE TRANSFER
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869
CHARGED PARTICLES
Three-dimensional shielding effects on charged particle fluences measured in the P0006 experiment in LDEF
p 3165 N92-27235
Study of the charge and energy distributions of low-energy particles of cosmic radiation in the near-earth orbit by the method of controllable nuclear emulsion
[DE92-620924] p 3195 N92-27494
Electromagnetic effects in Saturn's B ring
p 3193 N92-27637
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A248399] p 3162 N92-27751
CHARPY IMPACT TEST
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139
Correlation between fracture toughness, Charpy V-notch impact energy, and yield strength for ASTM A723 steel
[AD-A249142] p 3075 N92-28143
CHARTS
Datums, ellipsoids, grids, and grid reference systems
[AD-A247651] p 3118 N92-27554
CHEBYSHEV APPROXIMATION
Cracks on or near an interface p 3116 N92-27643
CHECKOUT
Improved classified material control through the application of a database management system
[AD-A245376] p 3180 N92-27440
CHEMICAL ANALYSIS
Micrometeoroids and debris on LDEF
p 3192 N92-27243
SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2
p 3193 N92-27259
The effect of jet fuel exposure on advanced aerospace composites. Part 1: Thermal and chemical analysis
[AD-A248559] p 3088 N92-27531
Chemical analysis of aromatics in diesel fuels
[PB92-167311] p 3072 N92-28207
CHEMICAL BONDS
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122
CHEMICAL COMPOSITION
Heavy Ions In Space (HIIS) experiment
p 3165 N92-27240
X ray scattering studies of polyimide thin films from poly(amic acid)s functionalized with a methacrylate
[DE92-010120] p 3075 N92-27364
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515
Shielded metal arc welding consumables for advanced high strength steels
[AD-A247005] p 3075 N92-28136
CHEMICAL REACTIONS
Spectroscopy, reaction, and photodissociation in highly vibrationally excited molecules
[DE92-010651] p 3163 N92-27396
The relevance of the DeBroglie velocity (V1= h/2md1) to shock loading induced reactions in lead azide
[AD-A246478] p 3177 N92-27607
The observable effects of gravity waves on airglow emissions
[ISBN-0-315-57927-7] p 3127 N92-27620
The determination of interfacial structure and phase transitions in Al/Cu and Al/Ni interfaces by means of surface extended x ray absorption fine structure
[DE92-009373] p 3074 N92-27913
CHEMILUMINESCENCE
The observable effects of gravity waves on airglow emissions
[ISBN-0-315-57927-7] p 3127 N92-27620
CHEMISORPTION
Solid-vapor adsorption refrigeration system development
[PB92-164383] p 3081 N92-27715
Vibrational spectroscopic studies of surface chemical interactions in chemisorption and catalysis
[DE92-011189] p 3072 N92-28046
CHIPS (ELECTRONICS)
Integrated optical pipelined polynomial processors
[AD-A248573] p 3092 N92-27992
CHIPS (MEMORY DEVICES)
Video-text processing by using Motorola 68020 CPU and its environment
[AD-A245775] p 3184 N92-27911
CHIRAL DYNAMICS
The Cornwall-Norton model in the strong coupling regime
[DE92-621061] p 3164 N92-27498
CHROMIUM
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837
CHROMIUM COMPOUNDS
Spectral properties of a novel laser crystal Y3(In, Ga)2Ga3O12:Cr3(+)
[AD-A246254] p 3175 N92-27201
CIRCUITS
Computation of magnetic suspension of maglev systems using dynamic circuit theory p 3065 N92-27813
A circuit model for two-path cutoff waveguide dielectric resonator filters
[AD-A247785] p 3092 N92-27884
CIRCULATION
Three dimensional flow in sharp bends --- ducted flow
p 3099 N92-27481
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber
p 3050 N92-27484
CITIES
Clean air act requirements for trace metals information
[PB92-164995] p 3125 N92-28206
CLAMPS
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps
p 3193 N92-27256
LDEF materials data analysis: Representative examples p 3078 N92-27272
Spectral infrared hemispherical reflectance measurements for LDEF tray clamps
p 3170 N92-27295
Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296
CLASSIFICATIONS
Dual-task performance as a function of presentation mode and individual differences in verbal and spatial ability
[AD-A246611] p 3139 N92-27535
Narrowband and broadband envelope cues for aural classification
[AD-A248693] p 3163 N92-28011
CLEAVAGE
Determination of minimum adherend thickness for climbing drum and floating roller adhesive tests
[AD-A248883] p 3111 N92-27996
CLIMATE
NSERC/AES Industrial Research Chairs in climate research, McGill University
[CRG-89-4] p 3124 N92-27343
Review of climatic fluctuations on the century timescale
[CGCR-89-7] p 3124 N92-27426
Activities of the Centre for Climate and Global Change Research
[CGCR-91-10] p 3125 N92-27641
A prototype climate information system
[AD-A245352] p 3131 N92-28039
Global climate change and international security
[DE92-010868] p 3125 N92-28056
CLIMATE CHANGE
Current and future trends in Arctic climate research: Can changes of the Arctic sea ice be used as an early indicator of global warming?
[CGCR-91-1] p 3131 N92-27340
NSERC/AES Industrial Research Chairs in climate research, McGill University
[CRG-89-4] p 3124 N92-27343
The oceans' role in climate variability and climate change
[CGCR-89-9] p 3124 N92-27359
Small satellites and RPAs in global-change research, summary and conclusions
[AD-A247855] p 3055 N92-27388
Sensitivity of global warming potentials to the assumed background atmosphere
[DE92-011072] p 3124 N92-27417
Activities of the Centre for Climate and Global Change Research
[CGCR-91-10] p 3125 N92-27641
Global climate change and international security
[DE92-010868] p 3125 N92-28056
The ocean's thermohaline circulation: Its stability, variability, and role in climate
[CGCR-91-12] p 3136 N92-28199
AES/NSERC Industrial Research Chairs (IRC) in climate research
[CGCR-91-9] p 3125 N92-28200
CLIMATOLOGY
NSERC/AES Industrial Research Chairs in climate research, McGill University
[CRG-89-4] p 3124 N92-27343
Climatic atlas of the Northern Hemisphere seasonal and annual mean sea-level pressures, 1952-1987
[CGCR-90-17] p 3128 N92-27425
Activities of the Centre for Climate and Global Change Research
[CGCR-91-10] p 3125 N92-27641
A prototype climate information system
[AD-A245352] p 3131 N92-28039
Global climate change and international security
[DE92-010868] p 3125 N92-28056
CLINICAL MEDICINE
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371
CLIPS
Radioactivities induced in some LDEF samples
p 3164 N92-27225
CLOCKS
Compiler-assisted static checkpoint insertion
[AD-A246496] p 3145 N92-27211
A formal model of asynchronous communication and its use in mechanically verifying a biphase mark protocol
[NASA-CR-4433] p 3153 N92-27586
Experimental validation of clock synchronization algorithms
[NASA-TP-3209] p 3153 N92-27589
CLOSED ECOLOGICAL SYSTEMS
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991
[NASA-TM-107546] p 3136 N92-27877
Johnson Space Center's regenerative life support systems test bed
[NASA-TM-107943] p 3144 N92-28157
CLOUD COVER
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
CCN spectra measurements as an active tracer of stratocumulus mechanisms --- cloud condensation nuclei
[AD-A246499] p 3129 N92-27668
CLOUD HEIGHT INDICATORS
CCN spectra measurements as an active tracer of stratocumulus mechanisms --- cloud condensation nuclei
[AD-A246499] p 3129 N92-27668
CLOUD PHYSICS
Location and characterization of in-cloud lightning currents by multiple station VHF and electric field measurements
[AD-A247051] p 3131 N92-27988
CLOUDS
Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147
CLOUDS (METEOROLOGY)
Implementations and analysis of foil chaff cloud measurements for the wind field in winter over northern Norway, at 75 up to 100 kilometers height
[BONN-IR-91-15] p 3128 N92-27420
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
Laboratory measurements of the transmission and scattering of laser beams in optically dense clouds
[ISBN-0-315-58085-2] p 3108 N92-27647
CLUSTER ANALYSIS
Investigation of alpha particle induced single-event upsets in charge-coupled devices
[AD-A246268] p 3090 N92-27662
CLUSTERS
Nanophase materials assembled from clusters
[DE92-010508] p 3076 N92-27412
CLUTTER
A new composite roughness surface scattering model
[AD-A248891] p 3085 N92-27970
CMOS
The para radiation effects current simulator
[AD-A248652] p 3106 N92-27993

COASTAL CURRENTS
Subinertial circulation on the Scotian Shelf observations and models
[ISBN-0-315-56167-X] p 3134 N92-27621
COASTS
Coastally trapped disturbances in the lower atmosphere
[ISBN-0-315-55186-0] p 3129 N92-27622
Assimilation modeling of coastal transition zone data and continental slope flow fields
[AD-A248692] p 3135 N92-28010
COATINGS
Degradation of optical components in a space environment p 3170 N92-27307
LDEF space optics handbook --- long duration exposure facility p 3171 N92-27311
Ruled and holographic experiment (AO 138-5) --- long duration exposure facility p 3107 N92-27312
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment p 3178 N92-27318
COAXIAL CABLES
Local area networks with fiber optics
[AD-A247033] p 3166 N92-27338
COBALT
Sensitivity of LDEF foil analyses using ultra-low background germanium versus large NaI(T1) multidimensional spectrometers p 3196 N92-27224
COBALT 60
Sensitivity of LDEF foil analyses using ultra-low background germanium versus large NaI(T1) multidimensional spectrometers p 3196 N92-27224
COCKPIT SIMULATORS
Experimental evaluation of candidate graphical microburst alert displays
[NASA-CR-189633] p 3047 N92-27424
RMS active damping augmentation p 3155 N92-27771
COCKPITS
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant p 3032 N92-27895
CODING
Implementation notes on bdes(1) --- data encryption implementation
[NASA-CR-190442] p 3147 N92-27560
Software metrics for total development cycle evaluation
[AD-A246477] p 3148 N92-27606
Fractal image encoding
[AD-A248003] p 3161 N92-27854
Iterative methods for estimation of 2-D AR parameters using a data-adaptive Toeplitz approximation algorithm
[AD-A246009] p 3151 N92-28049
COGENERATION
A simplified nonlinear model for a Combined Heat and Power (CHP) system
[RR-416] p 3081 N92-27926
COGNITION
Norms and the perception of events
[AD-A247032] p 3138 N92-27337
Causal models in the acquisition and instruction of programming skills
[AD-A248761] p 3141 N92-27969
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
Comparability of two cognitive performance assessment systems
[AD-A248760] p 3144 N92-28095
Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144
Individual differences in adaptive processing in complex learning and cognitive performance
[AD-A248586] p 3142 N92-28179
COGNITIVE PSYCHOLOGY
What and where in visual attention: Evidence from the neglect syndrome
[AD-A246932] p 3139 N92-27509
Comparability of two cognitive performance assessment systems
[AD-A248760] p 3144 N92-28095
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142
COHERENT RADAR
An 11-CM full-matrix polarimetric radar for meteorological research
[AD-A246893] p 3082 N92-27506
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
COHERENT RADIATION
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers
[AD-A247574] p 3108 N92-27566
Coherent communications --- fiber optics applications p 3086 N92-28086
COLLISION PARAMETERS
Bose-Einstein correlations in proton-antiproton collisions at square root of s equals 200 to 900 GeV
[ISBN-0-315-50129-4] p 3164 N92-27691
COLLISIONLESS PLASMAS
Microballooning mode in tokamaks
[PPL-107] p 3175 N92-28205
COLOR
Effects of color vision deficiency on detection of color-highlighted targets in a simulated air traffic control display
[AD-A246586] p 3139 N92-27500
COLOR VISION
Effects of color vision deficiency on detection of color-highlighted targets in a simulated air traffic control display
[AD-A246586] p 3139 N92-27500
COMBAT
Airpower planning and battle management training at airbase level p 3031 N92-27889
Situation assessment in the Paladin tactical decision generation system p 3032 N92-27892
Optimal guidance anticipating missile performance p 3034 N92-27902
ICAAS piloted simulation evaluation p 3034 N92-27906
COMBUSTIBLE FLOW
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber p 3050 N92-27484
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853
COMBUSTION
Calculation of turbulent reactive flows in general orthogonal coordinates
[NRC-32128] p 3104 N92-27693
COMBUSTION CHAMBERS
Structural analysis of thermal fatigue failures on rocket combustion chambers by the finite element method
[NAL-TR-1117] p 3067 N92-27430
Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber p 3050 N92-27484
Three dimensional calculations of reactive flows within aircraft combustion chambers including some combustion models p 3101 N92-27490
Experimental study of cross-stream mixing in a rectangular duct
[NASA-TM-105694] p 3049 N92-27652
COMBUSTION CHEMISTRY
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488
Three dimensional calculations of reactive flows within aircraft combustion chambers including some combustion models p 3101 N92-27490
COMBUSTION EFFICIENCY
An investigation into the performance characteristics of a solid fuel SCRAMJET propulsion device
[AD-A246486] p 3048 N92-27206
The coherent flamelet model for propulsion applications p 3073 N92-27486
COMBUSTION PHYSICS
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853
COMETS
Asteroidal versus cometary meteoroid impacts on the Long Duration Exposure Facility (LDEF) p 3193 N92-27263
COMMAND AND CONTROL
An approach to integration of real-time software for an autonomous underwater vehicle
[AD-A245377] p 3154 N92-27441
Airpower planning and battle management training at airbase level p 3031 N92-27889
Air situation establishment in a mobile multisensor environment p 3031 N92-27891
COMMERCE
DoD implementation guidelines for Electronic Data Interchange (EDI), volume 1
[AD-A246613] p 3184 N92-27536
Doing business with NASA
[NASA-NP-151] p 3182 N92-27843
Business planning for scientists and engineers
[DE92-010381] p 3188 N92-28042
COMMERCIAL AIRCRAFT
Drag reduction: An industrial challenge p 3036 N92-27708
COMMUNICATION CABLES
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007
COMMUNICATION EQUIPMENT
ALE frequency selection for Navy modems: Analysis
[AD-A247569] p 3083 N92-27564
Mid-range UV communications --- ultraviolet radiation
[AD-D015213] p 3083 N92-27615
A conceptual design for the Telecommunications Emergency Decision Support System (TEDSS)
[AD-A246045] p 3083 N92-27660
The electromagnetic pulse environment and its influence on tactical electronic and communications equipment
[AD-A246754] p 3087 N92-28129
COMMUNICATION NETWORKS
Communication analysis for the expendable explorer spacecraft
[NASA-CR-189273] p 3083 N92-27516
Applications of high speed networks
[AD-A246082] p 3153 N92-27525
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
Tactical communications network modelling and reliability analysis: An overview
[AD-A245339] p 3084 N92-27855
A communications model for an ISAS to NASA span link
[NASA-TM-107936] p 3088 N92-28187
Management of the Space Physics Analysis Network (SPAN)
[NASA-TM-107934] p 3187 N92-28188
COMMUNICATION SATELLITES
Management of the fleet satellite communications satellite acquisition for the Naval Postgraduate School
[AD-A246969] p 3082 N92-27400
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005
COMPATIBILITY
Using Ada bindings to the X window system
[AD-A245366] p 3146 N92-27436
Advanced materials for turbomachinery. Technical memo number 2: Advanced materials compatibility with storable propellants (monomethyl hydrazine and nitrogen tetroxide)
[AD-A246725] p 3080 N92-28070
COMPILERS
Compiler-assisted static checkpoint insertion
[AD-A246496] p 3145 N92-27211
Parallel knowledge based systems architectures for in-flight mission management p 3034 N92-27904
COMPLEX COMPOUNDS
Solid-vapor adsorption refrigeration system development
[PB92-164383] p 3081 N92-27715
COMPLEX SYSTEMS
Approximate confidence limit procedures for complex systems
[AD-A247253] p 3159 N92-27384
COMPLEX VARIABLES
The carcinogenic risks of low-LET and high-LET ionizing radiations
[DE92-010477] p 3136 N92-27349
COMPOSITE MATERIALS
Characterization of powder coated thermoplastic composite
[AD-A247230] p 3068 N92-27383
The effect of jet fuel exposure on advanced aerospace composites. Part 1: Thermal and chemical analysis
[AD-A246559] p 3068 N92-27531
A method to determine moisture profiles from total moisture weight-gain data in polymeric composites
[AD-A247449] p 3077 N92-27550
Residual thermal stresses in graphite/PEEK (APC-2) laminates
[AD-A247450] p 3077 N92-27592
IMI: In partnership with industry
[CTN-92-60490] p 3068 N92-27614
Industrial Materials Institute
[CTN-92-60488] p 3068 N92-27650
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819
Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827
Dual modular rocket launcher
[AD-D015228] p 3046 N92-28002
Smart structures: The relevance of fibre optics p 3086 N92-28091
COMPOSITE STRUCTURES
A method to determine moisture profiles from total moisture weight-gain data in polymeric composites
[AD-A247449] p 3077 N92-27550

Demonstration of manufacturing process for large area, multilayer piezoelectric composites
[AD-A246662] p 3069 N92-27761
Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827
Dual modular rocket launcher
[AD-D015228] p 3046 N92-28002

COMPRESSIBILITY EFFECTS
Ballooning and drift-Alfven modes in tokamaks
[PPL-104] p 3174 N92-28195

COMPRESSIBLE BOUNDARY LAYER
A fast, uncoupled, compressible, two-dimensional, unsteady boundary layer algorithm with separation for engine inlets
[NASA-TM-105686] p 3102 N92-27653
Instability and transition in compressible boundary layers
[AD-A248596] p 3105 N92-28062

COMPRESSIBLE FLOW
Computational techniques for solving the Navier-Stokes equations p 3094 N92-27451
Presentation of a computational code for 3-D compressible flow in complex channels and cavities p 3098 N92-27475
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle p 3100 N92-27482
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
Finite element methods for flow problems p 3102 N92-27672
Finite element methods for fluids p 3102 N92-27673
Unstructured grid methods for compressible flows p 3103 N92-27676
A study of compressible turbulence
[AD-A247001] p 3105 N92-27986
Instability and transition in compressible boundary layers
[AD-A248596] p 3105 N92-28062

COMPRESSOR BLADES
Experimental investigation of the unsteady pressure field around an oscillating blade
[MITT-90-01] p 3094 N92-27407
Application of S1BYL2 to the AGARD WG18 compressor test cases p 3094 N92-27452

COMPRESSOR ROTORS
Application of CFD in the design of gas turbine engine components p 3049 N92-27461

COMPRESSORS
Methodology for the determination of criticality codes and recertification intervals for Tank Mounted Air Compressors (TMAC) and Base Mounted Air Compressors (BMAC)
[NASA-CR-189268] p 3114 N92-27649
Solid-vapor adsorption refrigeration system development
[PB92-164383] p 3081 N92-27715
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation p 3039 N92-27944
The FML compressor as a drive system for the LFSWT: A narrative p 3052 N92-27978

COMPUTATION
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers
[AD-A246037] p 3108 N92-27657
Computational methods for stellerator configurations
[DE92-011131] p 3174 N92-28057

COMPUTATIONAL FLUID DYNAMICS
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450
Computational techniques for solving the Navier-Stokes equations p 3094 N92-27451
Steady and unsteady 3D flow computation through a transonic turbine stage p 3050 N92-27469
Three dimensional flow in sharp bends --- ducted flow p 3099 N92-27481
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle p 3100 N92-27482
Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber p 3050 N92-27484
Nonequilibrium 3D flows of air through inlets p 3100 N92-27487
Three dimensional calculations of reactive flows within aircraft combustion chambers including some combustion models p 3101 N92-27490
Finite element methods for flow problems p 3102 N92-27672
Multidimensional upwind methods for unstructured grids p 3102 N92-27675
Unstructured grid methods for compressible flows p 3103 N92-27676
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations p 3103 N92-27677
Finite element methods in CFD: Grid generation, adaptivity, and parallelization p 3103 N92-27679
A frontal approach for node generation in Delaunay triangulations p 3103 N92-27680
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation p 3039 N92-27944
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949
The benchmark aeroelastic models program: Description and highlights of initial results p 3041 N92-27960

COMPUTATIONAL GRIDS
An integrated CFD system for 3D turbomachinery applications p 3050 N92-27464
Calculation by the finite element method of 3-D turbulent flow in a centrifugal pump p 3097 N92-27465
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row p 3050 N92-27466
Navier-Stokes analysis of turbine blade heat transfer and performance p 3097 N92-27468
Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
Finite element methods for flow problems p 3102 N92-27672
Multidimensional upwind methods for unstructured grids p 3102 N92-27675
Unstructured grid methods for compressible flows p 3103 N92-27676
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations p 3103 N92-27677
Finite element methods in CFD: Grid generation, adaptivity, and parallelization p 3103 N92-27679
A frontal approach for node generation in Delaunay triangulations p 3103 N92-27680
A sophisticated cad tool for the creation of complex models for electromagnetic interaction analysis
[AD-A245936] p 3085 N92-27858
Unstructured-grid methods development for unsteady aerodynamic and aeroelastic analyses p 3038 N92-27938
Computations of unsteady flows around airfoil sections by explicit and implicit methods solving the Euler and Navier-Stokes equations p 3039 N92-27948
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957

COMPUTER AIDED DESIGN
Development of a standard anthropometric dimension set for use in computer-aided glove design
[AD-A246272] p 3143 N92-27664
BLADE: A propeller blade geometry generator program user's manual
[DREA-91-302] p 3149 N92-27697
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
Geometric modeling for computer aided design
[NASA-CR-190363] p 3149 N92-27829
System requirements specification for SMART structures mode p 3149 N92-27830
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages p 3149 N92-27831
Application driven interface generation for EASIE p 3145 N92-27832
Generating the complete control environment interface for EASIE p 3150 N92-27833
PDES Application Protocol Suite for Composites (PAS-C): State-Of-The-Art (SOTA) assessment for the PAS-C program
[AD-A247921] p 3069 N92-27849
A sophisticated cad tool for the creation of complex models for electromagnetic interaction analysis
[AD-A245936] p 3085 N92-27858
A circuit model for two-path cutoff waveguide dielectric resonator filters
[AD-A247785] p 3092 N92-27884
Research into the design and implementation of knowledge-base system
[AD-A247039] p 3151 N92-28075

COMPUTER AIDED MANUFACTURING
Development of a standard anthropometric dimension set for use in computer-aided glove design
[AD-A246272] p 3143 N92-27664

COMPUTER AIDED TOMOGRAPHY
Computed tomography analysis of castings
[AD-A249099] p 3074 N92-28053

COMPUTER ASSISTED INSTRUCTION
Causal models in the acquisition and instruction of programming skills
[AD-A248761] p 3141 N92-27969
Concept-flow diagrams: Method for design of computer-aided instruction
[AD-A246896] p 3150 N92-27984
The RHET system: A sequence of self-guided tutorials
[AD-A248960] p 3151 N92-28082
An experimental study in the use of computer-based instruction to teach automated spreadsheet functions
[AD-A246728] p 3152 N92-28104
Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144

COMPUTER GRAPHICS
Experimental evaluation of candidate graphical microburst alert displays
[NASA-CR-189633] p 3047 N92-27424
NPSNET: Physically-based modeling enhancements to an object file format
[AD-A246594] p 3146 N92-27504
Computer graphics for bearing dynamic analysis
[AD-A247567] p 3148 N92-27584
Design of a graphical user interface for a multimedia DBMS: Query Management Facility
[AD-A246397] p 3181 N92-27665
Designing a graphical user interface for a bilateral negotiation support system
[AD-A247910] p 3150 N92-27848

COMPUTER INFORMATION SECURITY
Improved classified material control through the application of a database management system
[AD-A245376] p 3180 N92-27440
Implementation notes on bdes(1) --- data encryption implementation
[NASA-CR-190442] p 3147 N92-27560
Applying the take-grant protection model
[NASA-CR-190439] p 3147 N92-27561
An introduction to computer viruses
[DE92-010727] p 3147 N92-27570
A proactive password checker
[NASA-CR-190438] p 3148 N92-27626
Integrity in automated information systems
[AD-A245555] p 3185 N92-28040

COMPUTER NETWORKS
Alternatives for developing user documentation for applications software
[AD-A247248] p 3145 N92-27215
National airspace data interchange network analysis
[AD-A247345] p 3044 N92-27217
Applications of high speed networks
[AD-A246082] p 3153 N92-27525
A proactive password checker
[NASA-CR-190438] p 3148 N92-27626
Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144
SPAN: Astronomy and astrophysics
[NASA-TM-107940] p 3192 N92-28185
SPAN: Ocean science
[NASA-TM-107939] p 3187 N92-28186
A communications model for an ISAS to NASA span link
[NASA-TM-107936] p 3088 N92-28187
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 19: Computer and information technology and aerospace knowledge diffusion
[NASA-TM-107927] p 3187 N92-28211

COMPUTER PROGRAM INTEGRITY
An introduction to computer viruses
[DE92-010727] p 3147 N92-27570
Software metrics for total development cycle evaluation
[AD-A246477] p 3148 N92-27606

COMPUTER PROGRAMMING
Alternatives for developing user documentation for applications software
[AD-A247248] p 3145 N92-27215
Enhancement of image processing capabilities for different environments
[AD-A246956] p 3145 N92-27333
Using ELROS to implement ISO application protocols
[DE92-010446] p 3145 N92-27367
Reusable software component retrieval via normalized algebraic specifications
[AD-A246002] p 3146 N92-27522
A reusable component retrieval system for prototyping
[AD-A246081] p 3147 N92-27524

Software metrics for total development cycle evaluation
[AD-A246477] p 3148 N92-27606
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781
Documentation requirements for software maintenance
[AD-A246716] p 3151 N92-28069
Relative utility of selected software requirement metrics
[AD-A246749] p 3152 N92-28106

COMPUTER PROGRAMS
Design and testing of a caseless solid-fuel integral-rocket ramjet engine for use in small tactical missiles
[AD-A246226] p 3066 N92-27196
The EPSA to PATRAN interface
[AD-A246489] p 3145 N92-27208
Electron interactions with non-linear polyatomic molecules and their radicals and ions
[AD-A246492] p 3163 N92-27210
Laser physics and laser techniques
[AD-A247326] p 3107 N92-27354
Approximate confidence limit procedures for complex systems
[AD-A247253] p 3159 N92-27384
Data compression and archiving software implementation and their algorithm comparison
[AD-A247853] p 3146 N92-27387
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade
p 3095 N92-27457
Validation of a CANARI code by the computation of three dimensional turbulent flow in turbine valve
p 3050 N92-27462
Viscous three-dimensional calculations of transonic fan performance p 3097 N92-27467
Evaluation of method of moments codes: University of Houston junction and numerical electromagnetic code
[AD-A247570] p 3083 N92-27565
An introduction to computer viruses
[DE92-010727] p 3147 N92-27570
Computer software project management: An introduction
[AD-A246147] p 3147 N92-27576
Software metrics for total development cycle evaluation
[AD-A246477] p 3148 N92-27606
A conceptual design for the Telecommunications Emergency Decision Support System (TEDSS)
[AD-A246045] p 3083 N92-27660
Massively parallel computing, C++, and hydrocode algorithms
[DE92-006739] p 3154 N92-27748
System requirements specification for SMART structures mode p 3149 N92-27830
Designing a graphical user interface for a bilateral negotiation support system
[AD-A247910] p 3150 N92-27848
Engine structures modeling software system: Computer code. User's manual
[NASA-CR-189154] p 3116 N92-27872
UT40 STARS reuse concept. Volume 1: Conceptual framework for reuse process version 1.0
[AD-A247267] p 3150 N92-27919
Navy Atmospheric Boundary Layer (NABL) model system: Software/Interface requirements specification
[AD-A247501] p 3127 N92-27922
The RHET system: A sequence of self-guided tutorials
[AD-A248960] p 3151 N92-28082
Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163

COMPUTER STORAGE DEVICES
An expert system for measuring, interpreting, and managing system performance factors for the work information management system
[AD-A246878] p 3182 N92-27824

COMPUTER SYSTEMS DESIGN
Local Area Network (LAN) compatibility issues
[AD-A247249] p 3153 N92-27212
Design of a graphical user interface for a multimedia DBMS: Query Management Facility
[AD-A246397] p 3181 N92-27685
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 19: Computer and information technology and aerospace knowledge diffusion
[NASA-TM-107927] p 3187 N92-28211

COMPUTER SYSTEMS PERFORMANCE
The EPSA to PATRAN interface
[AD-A246489] p 3145 N92-27208
Compiler-assisted static checkpoint insertion
[AD-A246496] p 3145 N92-27211
Local Area Network (LAN) compatibility issues
[AD-A247249] p 3153 N92-27212
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898

COMPUTER TECHNIQUES
Reusable software component retrieval via normalized algebraic specifications
[AD-A246002] p 3146 N92-27522
A reusable component retrieval system for prototyping
[AD-A246081] p 3147 N92-27524
Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552
A proactive password checker
[NASA-CR-190438] p 3148 N92-27626
Concept-flow diagrams: Method for design of computer-aided instruction
[AD-A246896] p 3150 N92-27984
Comparability of two cognitive performance assessment systems
[AD-A248760] p 3144 N92-28095
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163

COMPUTER VIRUSES
An introduction to computer viruses
[DE92-010727] p 3147 N92-27570

COMPUTER VISION
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
Development of a machine vision guidance system for automated assembly of space structures
p 3156 N92-27775

COMPUTERIZED SIMULATION
LDEF microenvironments, observed and predicted
p 3066 N92-27220
Development and application of a 3-D geometry/mass model for LDEF satellite ionizing radiation assessments
p 3165 N92-27236
Plasma Theory and Simulation Group
[AD-A246129] p 3171 N92-27330
Application of S1BYL2 to the AGARD WG18 compressor test cases p 3094 N92-27452
A mathematical constraint placed upon inter-blade row boundary conditions used in the simulation of multistage turbomachinery flows p 3095 N92-27458
Three dimensional flow in sharp bends --- ducted flow
p 3099 N92-27481
Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485
The coherent flamelet model for propulsion applications p 3073 N92-27486
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488
Comparison of Janus and field test aircraft detection ranges for the line-of-sight forward heavy system
[AD-A246047] p 3083 N92-27600
Finite element methods in CFD: Grid generation, adaptivity, and parallelization p 3103 N92-27679
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
Fuzzy guidance system evaluation
p 3034 N92-27903
ICAAS piloted simulation evaluation
p 3034 N92-27906
A time-linearization approach for unsteady transonic flows p 3038 N92-27941
Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147

COMPUTERS
SPAN: Astronomy and astrophysics
[NASA-TM-107940] p 3192 N92-28185

CONDENSATION NUCLEI
CCN spectra measurements as an active tracer of stratocumulus mechanisms --- cloud condensation nuclei
[AD-A246499] p 3129 N92-27668

CONDUCTION BANDS
Scanning tunneling microscopy of the organic semiconductor ((eta-C5Me5) 2Ru(1,4-(2(2))-cyclophane)) (TCNQ)4
[AD-A246848] p 3093 N92-28121

CONDUCTIVE HEAT TRANSFER
Long Duration Exposure Facility (LDEF) low-temperature Heat Pipe Experiment Package (HEPP) flight results
p 3106 N92-27317
Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades
p 3095 N92-27456

CONDUCTORS
Scanning tunneling microscopy of the organic conductors (TMTSF)2X(X = C1O4-, REO4-)
[AD-A246909] p 3168 N92-27720
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields
p 3060 N92-27746
The bearingless electrical machine
p 3061 N92-27793

CONFERENCES
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450
Fourth conference on the neurobiology of learning and memory
[AD-A247174] p 3140 N92-27538
Technology trends, threats, and opportunities (T(sup 3)O). Part 4: Proceedings of Workshop on Critical Enabling Technologies
[CTN-92-60495] p 3181 N92-27703
International Symposium on Magnetic Suspension Technology, part 1
[NASA-CP-3152-PT-1] p 3056 N92-27721
Conference on Combined Effects: Radiation, Microg ravity, Trauma, and other Factors
[AD-A247799] p 3065 N92-27862
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop
[NASA-CR-190461] p 3119 N92-28013
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
Air pollution effects on biodiversity
[PB92-170166] p 3125 N92-28208

CONFIDENCE LIMITS
Approximate confidence limit procedures for complex systems
[AD-A247253] p 3159 N92-27384
Equations for approximate lower confidence limits on process capability indices
[AD-A247591] p 3159 N92-27568

CONFIGURATION MANAGEMENT
Implementation of a configuration management system for a local area network
[AD-A246474] p 3153 N92-27605

CONIFERS
The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery
p 3119 N92-28015
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan
p 3119 N92-28017

CONNECTORS
High pressure fiber optic connector plug
[AD-D015246] p 3166 N92-27373
Spacecraft design project multipurpose satellite bus MPS
[NASA-CR-190009] p 3055 N92-27555

CONSERVATION
An investigation of the information propagation and entropy transport aspects of Stirling machine numerical simulation
[NASA-CR-189143] p 3105 N92-27975

CONSERVATION EQUATIONS
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes
p 3103 N92-27678

CONSERVATION LAWS
Multidimensional upwind methods for unstructured grids p 3102 N92-27675

CONSISTENCY
An empirical study of fault detection by static units-consistency analysis
[AD-A247592] p 3147 N92-27569

CONSTRUCTION
A self-zeroing capacitance probe for water wave measurements
[NASA-RP-1278] p 3135 N92-27930
Research into the design and implementation of knowledge-base system
[AD-A247039] p 3151 N92-28075

CONTAMINANTS
Contamination on LDEF sources: Distribution and history p 3073 N92-27297
Contamination measurements on experiment M0003 p 3073 N92-27298
Spacecraft thermal control coatings: Comparison between flight results obtained on LDEF and MIR p 3079 N92-27300
Simple-reversible fiber-optic chemical sensors using solvatochromic dyes [DE92-010441] p 3166 N92-27365

CONTAMINATION
Atomic oxygen effects on thermal control and mirror coatings: Evaluation of experiment A0034 p 3078 N92-27279
Oxygen isotopes implanted in the LDEF spacecraft p 3165 N92-27284
Contamination on LDEF sources: Distribution and history p 3073 N92-27297
Optical characterization of contaminant film — long duration exposure facility p 3170 N92-27308
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment p 3178 N92-27318

CONTINENTAL SHELVES
Subinertial circulation on the Scotian Shelf observations and models [ISBN-0-315-56167-X] p 3134 N92-27621
Assimilation modeling of coastal transition zone data and continental slope flow fields [AD-A248692] p 3135 N92-28010

CONTINUITY EQUATION
Microballooning mode in tokamaks [PPL-107] p 3175 N92-28205

CONTINUOUS RADIATION
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables [AD-A248393] p 3170 N92-28007

CONTINUOUS WAVE LASERS
Coherent laser radar vision system and taskspace identification p 3155 N92-27768

CONTINUOUS WAVE RADAR
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements [NASA-CR-190432] p 3083 N92-27520

CONTINUUM MECHANICS
The tensor equation AX + XA = G [AD-A246665] p 3157 N92-27762

CONTINUUM MODELING
Optimal control of large space structures using distributed gyricity: A continuum approach [ISBN-0-315-56953-0] p 3056 N92-27612

CONTRACT MANAGEMENT
Space Station: Contract oversight and performance provisions for major work packages. Briefing report to the Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space and Technology, House of Representatives [GAO/NSIAD-92-171BR] p 3182 N92-27928

CONTRACTORS
Doing business with NASA [NASA-NP-151] p 3182 N92-27843
Space Station: Contract oversight and performance provisions for major work packages. Briefing report to the Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space and Technology, House of Representatives [GAO/NSIAD-92-171BR] p 3182 N92-27928

CONTRAST
Spatio-temporal masking: Hyperacuity and local adaptation [AD-A246953] p 3138 N92-27331

CONTROL EQUIPMENT
International Symposium on Magnetic Suspension Technology, part 1 [NASA-CP-3152-PT-1] p 3056 N92-27721
Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722
Large-gap magnetic suspension systems p 3057 N92-27724
Dynamics and control of high precision magnetically levitated vibration isolation systems p 3058 N92-27730
Stability and performance of notch filter control for unbalance response p 3058 N92-27731
A six degree-of-freedom magnetic bearing for microgravity vibration isolation p 3058 N92-27732
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
Hand controller study of force and control mode p 3155 N92-27767
Scanning tunneling microscopy [AD-A249262] p 3178 N92-28218

CONTROL MOMENT GYROSCOPES
Performance of a superconducting large-angle magnetic suspension p 3065 N92-27815

CONTROL RODS
Demonstration of manufacturing process for large area, multilayer piezoelectric composites [AD-A246662] p 3069 N92-27761

CONTROL SIMULATION
A wind tunnel study of the pioneer remotely piloted vehicle [AD-A247028] p 3045 N92-27335
Optimal control of large space structures using distributed gyricity: A continuum approach [ISBN-0-315-56953-0] p 3056 N92-27612

CONTROL STABILITY
Space applications of diamagnetic suspensions p 3064 N92-27808

CONTROL SURFACES
Thermal Control Surfaces Experiment (TCSE) materials analysis p 3070 N92-27274

CONTROL SYSTEMS DESIGN
Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility [NASA-TM-4394] p 3048 N92-27379
A simple example of modeling hybrid systems using bialgebras: Preliminary version [NASA-CR-190331] p 3157 N92-27557
A six degree-of-freedom magnetic bearing for microgravity vibration isolation p 3058 N92-27732
Experimental results in nonlinear compensation of a one degree-of-freedom magnetic suspension p 3060 N92-27742
Control concepts for active magnetic bearings p 3060 N92-27743
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
Neural networks modeling and control of dynamical systems p 3155 N92-27769
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
Analysis and testing of a space crane articulating joint testbed p 3156 N92-27773
End-effector microprocessor p 3145 N92-27776
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms p 3113 N92-27780
International Symposium on Magnetic Suspension Technology, part 2 [NASA-CP-3152-PT-2] p 3061 N92-27788
Air Vehicle Mission Control and Management [AGARD-CP-504] p 3031 N92-27887
Statistical process control techniques for the telecommunications systems manager [AD-A249122] p 3183 N92-28172
Robust intelligent flight control for hypersonic vehicles [NASA-CR-185680] p 3051 N92-28209

CONTROL THEORY
Application of neural network to adaptive control theory for super-augmented aircraft [AD-A246596] p 3050 N92-27505
Application of narrow band control to reduce vibrations in magnetic bearing systems p 3057 N92-27729

CONTROLLABILITY
Note on flight measured control effectiveness of the quiet STOL experimental aircraft ASKA [NAL-TR-1103] p 3051 N92-28154

CONTROLLERS
Stability and performance of notch filter control for unbalance response p 3058 N92-27731
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
Extended H2 synthesis for multiple degree-of-freedom controllers p 3059 N92-27741
Experimental results in nonlinear compensation of a one degree-of-freedom magnetic suspension p 3060 N92-27742
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
Summary of compliant and multi-arm control at NASA Langley Research Center p 3155 N92-27764
Hand controller study of force and control mode p 3155 N92-27767
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782
Fuzzy guidance system evaluation p 3034 N92-27903
Video-text processing by using Motorola 68020 CPU and its environment [AD-A245775] p 3184 N92-27911

CONVECTION
Enhancement of boiling heat transfer in di-electric fluids [AD-A245962] p 3105 N92-28058

CONVECTION-DIFFUSION EQUATION
Finite element methods for flow problems p 3102 N92-27672

CONVERGENT-DIVERGENT NOZZLES
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489

COOLING
Users manual and modeling improvements for axial turbine design and performance computer code TD2-2 [NASA-CR-189118] p 3035 N92-27376
Further investigation of the effect of model cooling on periodic transonic flow p 3042 N92-27961

COOLING FINS
The use of electrical transmission line theory to predict the performance of spacecraft radiators [AD-A247786] p 3091 N92-27861

COOLING FLOWS (ASTROPHYSICS)
Turbulent cooling flows in galaxies and clusters [ISBN-0-315-61634-2] p 3191 N92-27699

COOLING SYSTEMS
Structural analysis of thermal fatigue failures on rocket combustion chambers by the finite element method [NAL-TR-1117] p 3067 N92-27430
Numerical representation of heat transfer into turbine blade cooling ducts p 3098 N92-27474
Presentation of a computational code for 3-D compressible flow in complex channels and cavities p 3098 N92-27475

COOPERATION
A teamwork model of pilot aiding: Psychological principles for mission management systems design p 3032 N92-27893

COPOLYMERIZATION
Bislactone curing agents for epoxy resins and polymers obtained therefrom [AD-D015221] p 3077 N92-27618
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer [AD-A248164] p 3077 N92-27867

COPOLYMERS
LDEF polymeric materials: 10 months versus 5.8 years of exposure p 3079 N92-27282
Bislactone curing agents for epoxy resins and polymers obtained therefrom [AD-D015221] p 3077 N92-27618
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer [AD-A248164] p 3077 N92-27867

COPPER
Interaction of atomic oxygen with thin film and bulk copper: An XPS, AES, XRD, and profilometer study p 3166 N92-27302
The determination of interfacial structure and phase transitions in Al/Cu and Al/Ni interfaces by means of surface extended x ray absorption fine structure [DE92-009373] p 3074 N92-27913
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives [AD-A248738] p 3077 N92-27966
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon [AD-A248958] p 3178 N92-28081
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces [AD-A246836] p 3075 N92-28119

COPPER ALLOYS
Structural materials for high-heat flux applications [DE92-010253] p 3073 N92-27346

COPPER OXIDES
Application of ceramic superconductors in high speed turbines p 3061 N92-27791
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials [AD-A248706] p 3177 N92-28012
Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials [AD-A248736] p 3078 N92-28126
High performance YBCO films [AD-A246802] p 3093 N92-28130

CORE FLOW
A fast, uncoupled, compressible, two-dimensional, unsteady boundary layer algorithm with separation for engine inlets [NASA-TM-105686] p 3102 N92-27653

CORES
Magnetic suspension using high temperature superconducting cores p 3061 N92-27789
Permeable prolate spheroid in an external field: Demagnetization and gradiometer performance [AD-A245932] p 3106 N92-27857

CORIOLIS EFFECT
Numerical representation of heat transfer into turbine blade cooling ducts p 3098 N92-27474

CORROSION
High-solids and 100-percent solids coatings: A state-of-the-art investigation
[AD-A247557] p 3076 N92-27539
COSMIC DUST
Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328
COSMIC RAYS
LDEF: Dosimetric measurement results (AO 138-7 experiment) p 3165 N92-27231
Radiation model predictions and validation using LDEF data p 3165 N92-27237
Cosmogenic radioisotopes on LDEF surfaces p 3165 N92-27239
Ultra heavy cosmic ray experiment (A0178) p 3196 N92-27241
Combination of probabilities in looking for cosmic ray sources
[DE92-010350] p 3195 N92-27390
Study of the charge and energy distributions of low-energy particles of cosmic radiation in the near-earth orbit by the method of controllable nuclear emulsion
[DE92-620924] p 3195 N92-27494
To the primary results of experiments in cosmic radiation particle investigation in the energy range E(greater than equals)2 TeV at the KOSMOS-1713 satellite with the SOKOL-2 equipment
[DE92-620935] p 3195 N92-27495
New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876
COSMOLOGY
Clustering of faint galaxies
[ISBN-0-315-53743-4] p 3189 N92-27686
COST ANALYSIS
Battery cars on superconducting magnetically levitated carriers: One commuting solution p 3065 N92-27811
COST EFFECTIVENESS
Multi-use lunar telescopes
[NASA-TM-107908] p 3189 N92-27651
Attractive and repulsive magnetic suspension systems overview p 3064 N92-27805
The electromagnetic pulse environment and its influence on tactical electronic and communications equipment
[AD-A246754] p 3087 N92-28129
An appraisal of cost-effectiveness models used in the Air Force and Navy aircraft engine component improvement programs
[AD-A245910] p 3049 N92-28162
A communications model for an ISAS to NASA span link
[NASA-TM-107936] p 3088 N92-28187
COST REDUCTION
Data compression using artificial neural networks
[AD-A246906] p 3149 N92-27718
COUNTER-ROTATING WHEELS
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809
COUPLING
Investigations of the seafloor coupling characteristics of the new ONR OBS and related questions
[AD-A246241] p 3131 N92-27199
Spectral properties of a novel laser crystal Y3(In, Ga)2Ga3O12:Cr3(+)
[AD-A246254] p 3175 N92-27201
Birth of universes with non-minimal coupling
[ISBN-0-315-55826-1] p 3190 N92-27623
COVERINGS
LEO effects on candidate solar cell cover materials p 3124 N92-27321
CRACK INITIATION
Structural analysis of thermal fatigue failures on rocket combustion chambers by the finite element method
[NAL-TR-1117] p 3067 N92-27430
CRACK PROPAGATION
Cracks on or near an interface p 3116 N92-27643
Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318
[DE92-009408] p 3117 N92-28041
CRACKS
Add-on damping treatment for life extension of the F-15 upper-outer wing skin
[AD-A246149] p 3050 N92-27577
Cracks on or near an interface p 3116 N92-27643
CRANES
A space crane concept for performing on-orbit assembly p 3155 N92-27772
Analysis and testing of a space crane articulating joint testbed p 3156 N92-27773
CRATERING
Interplanetary meteoroid debris in LDEF metal craters p 3193 N92-27258
CRATERS
Meteoroid and debris special investigation group; status of 3-D crater analysis from binocular imagery p 3192 N92-27251
Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257
Observation of fullerenes (C60-C70) associated with LDEF crater number 31 p 3073 N92-27262
Asteroidal versus cometary meteoroid impacts on the Long Duration Exposure Facility (LDEF) p 3193 N92-27263
Modelling the near-Earth space environment using LDEF data p 3128 N92-27265
CREATIVITY
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
CREEP PROPERTIES
The viscoelastic characterization of polymer materials exposed to the low-Earth orbit environment p 3079 N92-27283
Investigation of the rate-controlling mechanism(s) for high temperature creep and the relationship between creep and melting by use of high pressure as a variable
[DE92-011058] p 3074 N92-27416
CREVASSES
Surface analyses of composites exposed to the space environment on LDEF p 3070 N92-27293
CREW PROCEDURES (INFLIGHT)
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518
CREWS
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990
CRITICAL TEMPERATURE
Application of the renormalization group to critical phenomena in magnetic systems
[ISBN-0-315-56216-1] p 3161 N92-27638
CROP GROWTH
Johnson Space Center's regenerative life support systems test bed
[NASA-TM-107943] p 3144 N92-28157
CROSS CORRELATION
Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030
CROSS COUPLING
Design of bearings for rotor systems based on stability p 3063 N92-27799
CROSS FLOW
Instability and transition in compressible boundary layers
[AD-A248596] p 3105 N92-28062
CROSSLINKING
Optical Terminal Definition for the Future Service Growth (FSG) module of the Advanced Tracking and Data Relay Satellite (ATDRSS)
[NASA-CR-189270] p 3055 N92-28219
CRYOGENIC WIND TUNNELS
Cryogenic test rig with an aerodynamic magnetically levitated carriage p 3052 N92-27792
CRYOGENICS
A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle
[NASA-CR-188055] p 3052 N92-27976
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle p 3052 N92-27977
CRYPTOGRAPHY
Implementation notes on bdes(1) --- data encryption implementation
[NASA-CR-190442] p 3147 N92-27560
CRYSTAL DEFECTS
A study of the microstructural basis for the strength and toughness properties of overaged HSLA-100 steel
[AD-A246955] p 3073 N92-27332
CRYSTAL GROWTH
Follow up on the crystal growth experiments of the LDEF p 3178 N92-27268
Characterization of semi-insulating gallium arsenide
[AD-A246511] p 3177 N92-27632
Research in high dielectric properties of ferroelectric materials
[AD-A246899] p 3177 N92-27985
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon
[AD-A248958] p 3178 N92-28081
CRYSTAL OPTICS
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181
CRYSTAL OSCILLATORS
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181
CRYSTAL STRUCTURE
Scanning tunneling microscopy of the organic conductors (TMTSF)2X(X = C1O4-, REO4-)
[AD-A246909] p 3168 N92-27720
Development of the microstructure based stochastic life prediction models
[AD-A246447] p 3074 N92-27821
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012
Scanning tunneling microscopy of the organic semiconductor ((eta-C5Me5) 2Ru(1,4-(2(2))-cyclophane)) (TCNQ)4
[AD-A246848] p 3093 N92-28121
CRYSTAL SURFACES
Solid state research
[AD-A247338] p 3176 N92-27216
Spectroscopy and reactions of hydrazoic acid on silicon single crystal surfaces. (2). HN3 and DN3 on Si (100)
[AD-A247047] p 3177 N92-28077
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon
[AD-A248958] p 3178 N92-28081
CRYSTALLINITY
Synthesis and characterization of new poly(alkyl/arylphosphazenes)
[AD-A245380] p 3076 N92-27442
CRYSTALS
Spectral properties of a novel laser crystal Y3(In, Ga)2Ga3O12:Cr3(+)
[AD-A246254] p 3175 N92-27201
Holographic data storage crystals for the LDEF --- long duration exposure facility p 3178 N92-27313
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
CUBANE
First, second, and third generation high energy materials from cubane
[AD-A247559] p 3080 N92-27562
CUES
Effects of color vision deficiency on detection of color-highlighted targets in a simulated air traffic control display
[AD-A246586] p 3139 N92-27500
CUMULUS CLOUDS
Momentum transport by cumulus clouds and its parameterization
[ISBN-0-315-54644-1] p 3129 N92-27610
CURING
Bislactone curing agents for epoxy resins and polymers obtained therefrom
[AD-D015221] p 3077 N92-27618
CURRENT DENSITY
Magnetic fields generated by internal ocean seawater motion
[AD-A246589] p 3132 N92-27502
CURVATURE
Boundary value problems on S(exp n) for surfaces of constant Gauss curvature
[PB92-134410] p 3158 N92-27909
CURVE FITTING
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382
CURVED BEAMS
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27716
CUTTING
Foreign object damage to tires operating in a wartime environment
[AD-A247195] p 3043 N92-27682
CYCLIC COMPOUNDS
First, second, and third generation high energy materials from cubane
[AD-A247559] p 3080 N92-27562
CYCLOGENESIS
Integrated microwave and infrared precipitation analysis
[AD-A246070] p 3130 N92-27787

The effect of latent heat release on the ERICA IOP-5 cyclone
[AD-A245779] p 3130 N92-27912
CYCLONES
The effect of latent heat release on the ERICA IOP-5 cyclone
[AD-A245779] p 3130 N92-27912
CYLINDRICAL BODIES
Numerical representation of heat transfer into turbine blade cooling ducts p 3098 N92-27474
The large-angle magnetic suspension test fixture p 3065 N92-27816
High performance YBCO films
[AD-A246802] p 3093 N92-28130
CZOCHRALSKI METHOD
Wide gap, permanent magnet biased magnetic bearing system p 3062 N92-27794

D

DAMAGE
Foreign object damage to tires operating in a wartime environment
[AD-A247195] p 3043 N92-27682
DAMAGE ASSESSMENT
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
Ground vibration tests of a high fidelity truss for verification of on orbit damage location techniques
[NASA-TM-107626] p 3115 N92-27375
Smart structures: The relevance of fibre optics p 3086 N92-28091
A preliminary study on damage detection using piezoelectric film
[AD-A246350] p 3046 N92-28118
DAMPING
Development of an active damping system to aid in the attitude control of flexible spacecraft
[AD-A246248] p 3050 N92-27200
DARK MATTER
Topics in galactic dynamics
[ISBN-0-315-47774-1] p 3190 N92-27611
DATA ACQUISITION
Collection, analysis, and archival of LDEF activation data p 3188 N92-27227
LDEF space optics handbook --- long duration exposure facility p 3171 N92-27311
SLAC B Factory computing
[DE92-010745] p 3154 N92-27368
Software metrics for total development cycle evaluation
[AD-A246477] p 3148 N92-27606
National oceanographic fleet platform characteristics
[AD-A246452] p 3135 N92-27667
Small balloon ballistic tracing and behavior anomalies
[AD-A247435] p 3130 N92-27845
DATA BASE MANAGEMENT SYSTEMS
Databases for LDEF results p 3188 N92-27270
Improved classified material control through the application of a database management system
[AD-A245376] p 3180 N92-27440
Reusable software component retrieval via normalized algebraic specifications
[AD-A246002] p 3146 N92-27522
Design and implementation of a multimedia DBMS: Modification and deletion
[AD-A246080] p 3180 N92-27523
A reusable component retrieval system for prototyping
[AD-A246081] p 3147 N92-27524
DFQL: A graphical dataflow query language
[AD-A246086] p 3180 N92-27526
Software tools for acoustic database management
[AD-A247636] p 3181 N92-27553
Design of a graphical user interface for a multimedia DBMS: Query Management Facility
[AD-A246397] p 3181 N92-27665
Design and implementation of a multimedia DBMS: Complex query processing
[AD-A247054] p 3181 N92-27681
A prototype climate information system
[AD-A245352] p 3131 N92-28039
Reviews of computing technology: A review of compound document architectures
[DE92-011375] p 3151 N92-28048
SPAN: Astronomy and astrophysics
[NASA-TM-107940] p 3192 N92-28185
SPAN: Ocean science
[NASA-TM-107939] p 3187 N92-28186
DATA BASES
EnviroNET: An on-line environment data base for LDEF data p 3188 N92-27222
Databases for LDEF results p 3188 N92-27270
Materials And Processes Technical Information System (MAPTIS) LDEF materials database p 3188 N92-27271
Long Duration Exposure Facility experiment M0003 deintegration observation database p 3078 N92-27273
DFQL: A graphical dataflow query language
[AD-A246086] p 3180 N92-27526
Software tools for acoustic database management
[AD-A247636] p 3181 N92-27553
Implementation of a configuration management system for a local area network
[AD-A246474] p 3153 N92-27605
Hindcast wave information for the great lakes: Lake Ontario
[AD-A246446] p 3135 N92-27820
Application driven interface generation for EASIE p 3145 N92-27832
Generating the complete control environment interface for EASIE p 3150 N92-27833
Iterative methods for estimation of 2-D AR parameters using a data-adaptive Toeplitz approximation algorithm
[AD-A246009] p 3151 N92-28049
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 14: An analysis of the technical communications practices reported by Israeli and US aerospace engineers and scientists
[NASA-TM-107924] p 3186 N92-28183
DATA COMPRESSION
Spatio-temporal masking: Hyperacuity and local adaptation
[AD-A246953] p 3138 N92-27331
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352
Data compression and archiving software implementation and their algorithm comparison
[AD-A247853] p 3146 N92-27387
Compression and decompression of digital seismic waveform data for storage and communication
[DE92-621016] p 3183 N92-27496
Data compression using artificial neural networks
[AD-A246906] p 3149 N92-27718
Fractal image encoding
[AD-A248003] p 3161 N92-27854
Adaptive compression of multisensor image data
[AD-A248389] p 3151 N92-28006
Information content of polarimetric SAR data p 3088 N92-28033
DATA CORRELATION
SPAN: Astronomy and astrophysics
[NASA-TM-107940] p 3192 N92-28185
SPAN: Ocean science
[NASA-TM-107939] p 3187 N92-28186
DATA LINKS
Analysis of space environment effects on active fiber optic links orbited aboard the LDEF --- long duration exposure facility p 3171 N92-27315
Advanced systems engineering and network planning support
[NASA-CR-189274] p 3182 N92-27972
Fiber optic data busses for aircraft p 3048 N92-28093
SPAN: Ocean science
[NASA-TM-107939] p 3187 N92-28186
DATA MANAGEMENT
National airspace data interchange network analysis
[AD-A247345] p 3044 N92-27217
An information systems architecture analysis for Naval Air Systems Command
[AD-A247787] p 3184 N92-27885
Advanced systems engineering and network planning support
[NASA-CR-189274] p 3182 N92-27972
Guidelines for the development of a Project Data Management Plan (PDMP)
[NASA-TM-107935] p 3183 N92-28156
DATA PROCESSING
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382
Scope ambiguity and inference
[AD-A247448] p 3148 N92-27591
Design of a graphical user interface for a multimedia DBMS: Query Management Facility
[AD-A246397] p 3181 N92-27665
Design and implementation of a multimedia DBMS: Complex query processing
[AD-A247054] p 3181 N92-27681
Tactical communications network modelling and reliability analysis: An overview
[AD-A245339] p 3084 N92-27855
Natural language processing of captions for retrieving multimedia data
[AD-A247780] p 3184 N92-27860
Guidelines for the development of a Project Data Management Plan (PDMP)
[NASA-TM-107935] p 3183 N92-28156
Management of the Space Physics Analysis Network (SPAN)
[NASA-TM-107934] p 3187 N92-28188
DATA PROCESSING EQUIPMENT
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038
DATA REDUCTION
Collection, analysis, and archival of LDEF activation data p 3188 N92-27227
Automated screening of propulsion system test data by neural networks, phase 1
[NASA-CR-184329] p 3066 N92-27403
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515
DATA STORAGE
Collection, analysis, and archival of LDEF activation data p 3188 N92-27227
Holographic data storage crystals for the LDEF --- long duration exposure facility p 3178 N92-27313
LDEF archival system plan p 3188 N92-27324
Compression and decompression of digital seismic waveform data for storage and communication
[DE92-621016] p 3183 N92-27496
Design and implementation of a multimedia DBMS: Modification and deletion
[AD-A246080] p 3180 N92-27523
Variable hold time in dynamic random access memories
[AD-A248602] p 3144 N92-28063
DATA STRUCTURES
Design and implementation of a multimedia DBMS: Modification and deletion
[AD-A246080] p 3180 N92-27523
DATA SYSTEMS
LDEF archival system plan p 3188 N92-27324
Automated screening of propulsion system test data by neural networks, phase 1
[NASA-CR-184329] p 3066 N92-27403
DATA TRANSMISSION
Compression and decompression of digital seismic waveform data for storage and communication
[DE92-621016] p 3183 N92-27496
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005
High speed local area networks p 3086 N92-28087
Fiber optic data busses for aircraft p 3048 N92-28093
INMARSAT communications system: A systems approach
[AD-A246820] p 3087 N92-28134
DEATH VALLEY (CA)
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
DEBRIS
Foreign object damage to tires operating in a wartime environment
[AD-A247195] p 3043 N92-27682
DECIDUOUS TREES
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan p 3119 N92-28017
DECISION MAKING
Determining rules for closing customer service centers: A public utility company's fuzzy decision
[NASA-CR-190390] p 3181 N92-27572
Measuring uncertainty by extracting fuzzy rules using rough sets and extracting fuzzy rules under uncertainty and measuring definability using rough sets
[NASA-CR-190394] p 3148 N92-27585
A conceptual design for the Telecommunications Emergency Decision Support System (TEDSS)
[AD-A246045] p 3083 N92-27660
Situation assessment in the Paladin tactical decision generation system p 3032 N92-27892
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant p 3032 N92-27895
Effects of subordinate feedback to the supervisor and participation in decision-making in the prediction of organizational support
[AD-A249125] p 3183 N92-28083
An appraisal of cost-effectiveness models used in the Air Force and Navy aircraft engine component improvement programs
[AD-A245910] p 3049 N92-28162
DECISION THEORY
Exponential error bounds on codes for noisy channels with inaccurately known statistics and for generalized decision rules
[AD-A246064] p 3158 N92-27834

The RHET system: A sequence of self-guided tutorials
[AD-A248960] p 3151 N92-28082

DECODERS
Exponential error bounds on codes for noisy channels with inaccurately known statistics and for generalized decision rules
[AD-A246064] p 3158 N92-27834

DECODING
Exponential error bounds on codes for noisy channels with inaccurately known statistics and for generalized decision rules
[AD-A246064] p 3158 N92-27834

DECOMPOSITION
Vibrational spectroscopic studies of surface chemical interactions in chemisorption and catalysis
[DE92-011189] p 3072 N92-28046

DEEP WATER
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666
The ocean's thermohaline circulation: Its stability, variability, and role in climate
[CGCR-91-12] p 3136 N92-28199

DEFENSE PROGRAM
An assessment of the economic status of the antifriction bearing industry
[AD-A245373] p 3110 N92-27439
FY 1992/1993 biennial RDT and E descriptive summaries: DARPA. Amended
[AD-A247452] p 3218 N92-27593
Highlights of total quality management in the Department of Defense: Lessons learned, quality measurements, and innovative practices
[AD-A246167] p 3114 N92-27602
Technology trends, threats, and opportunities (T(sup 3)O). Part 4: Proceedings of Workshop on Critical Enabling Technologies
[CTN-92-60495] p 3181 N92-27703
Establishing a Department of Defense program management body of knowledge
[AD-A246625] p 3182 N92-27979
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 13: Wright Laboratory
[AD-A248776] p 3218 N92-28078
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 9: Wright Laboratory
[AD-A248772] p 3218 N92-28096
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 6: Armstrong Laboratory, Wilford Hall Medical Center
[AD-A248769] p 3219 N92-28109
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 7: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248770] p 3219 N92-28110
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 8: Rome Laboratory, Arnold Engineering Development Center, F. J. Seiler Research Laboratory
[AD-A248771] p 3219 N92-28111
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5A: Wright Laboratory
[AD-A248767] p 3219 N92-28127
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5B: Wright Laboratory
[AD-A248768] p 3219 N92-28128
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research
[NASA-TM-107925] p 3187 N92-28220

DEFORMATION
Adiabatic shear bands in simple and dipolar viscoplastic materials
[AD-A246055] p 3077 N92-27545
Deformations of complex structures on gamma/SL2(C) and cohomology of local systems p 3161 N92-27556
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream
p 3039 N92-27946
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957

DEGRADATION
Atomic oxygen effects on thermal control and mirror coatings: Evaluation of experiment A0034
p 3078 N92-27279
An ESR study of the UV degradation of FEP
p 3079 N92-27287
Degradation of electro-optic components aboard LDEF --- long duration exposure facility p 3170 N92-27306
Degradation of optical components in a space environment p 3170 N92-27307
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309

DEGREES OF FREEDOM
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
Extended H2 synthesis for multiple degree-of-freedom controllers p 3059 N92-27741
Experimental results in nonlinear compensation of a one degree-of-freedom magnetic suspension
p 3060 N92-27742

DELIVERY
Performance parameter methodology update for information delivery times
[AD-A248897] p 3185 N92-27997

DEMAGNETIZATION
Permeable prolate spheroid in an external field: Demagnetization and gradiometer performance
[AD-A245932] p 3106 N92-27857

DEPLOYMENT
Survivability of meteor burst communication under adverse operating conditions
[AD-A248632] p 3085 N92-28065

DEPOSITION
Optical characterization of contaminant film --- long duration exposure facility p 3170 N92-27308
The structure and reactivity of boron surfaces
[AD-A247265] p 3071 N92-27510
The plasma physics of processing discharges
[AD-A247560] p 3172 N92-27563

DEPRIVATION
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094

DESERTS
Dust and sand forecasting in Iraq and adjoining countries
[AD-A247588] p 3129 N92-27551

DESIGN ANALYSIS
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle
[NASA-CR-188055] p 3052 N92-27976

DESORPTION
Kinetics of surface reactions studied by laser desorption with FTMS detection
[AD-A248412] p 3109 N92-28051

DETECTION
Area-of-Interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
Visual attention and perception in three-dimensional space
[AD-A247823] p 3141 N92-27910

DEUTERIUM PLASMA
Analytical formula for ignition access condition in a magnetic fusion reactor
[PPL-114] p 3173 N92-27882
Operation path method for ignition criterion in a D-T tokamak reactor
[PPL-122] p 3174 N92-28193
Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194

DEUTERONS
The neutron-deuteron in hyperspherical formalism
[BONN-IR-91-13] p 3163 N92-27421

DIAGRAMS
Advanced user interface capabilities for application on portable computers
[AD-A247295] p 3144 N92-28177

DIAMAGNETISM
Space applications of diamagnetic suspensions
p 3064 N92-27808

DIAMONDS
Diamond as an optical material
[AD-A247628] p 3167 N92-27599
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon
[AD-A248958] p 3178 N92-28081
Materials processing of diamond: Etching, doping by ion implantation and contact formation
[AD-A248447] p 3078 N92-28148

DIAPHRAGMS (MECHANICS)
Burst diaphragm sequence valve
[AD-D015241] p 3110 N92-27629

DIELECTRIC PROPERTIES
Investigation of polyisocyanates as second harmonic generating materials
[DE92-010445] p 3089 N92-27366
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
Research in high dielectric properties of ferroelectric materials
[AD-A246899] p 3177 N92-27985
Soil moisture measurements from airborne SAR
p 3120 N92-28020

DIELECTRICS
Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology
[AD-A246989] p 3089 N92-27401
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513
Theory of multilayer dielectric planar waveguides and its applications
[ISBN-0-315-49255-4] p 3168 N92-27625
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers
[AD-A246037] p 3108 N92-27657
A circuit model for two-path cutoff waveguide dielectric resonator filters
[AD-A247785] p 3092 N92-27884
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
Radiation, scattering, and guidance of electromagnetic fields by arbitrarily shaped structures embedded in layered dielectric media
[AD-A248951] p 3085 N92-28066
High performance YBCO films
[AD-A246802] p 3093 N92-28130

DIESEL ENGINES
Heavy duty transport research needs assessment
[DE92-010622] p 3109 N92-27394
The relationship between fuel lubricity and diesel injection system wear
[AD-A247927] p 3110 N92-27851

DIESEL FUELS
The relationship between fuel lubricity and diesel injection system wear
[AD-A247927] p 3110 N92-27851
Chemical analysis of aromatics in diesel fuels
[PB92-167311] p 3072 N92-28207

DIFFERENCE EQUATIONS
Explicit solution of difference equation for the wavenumber response of fluid-loaded stiffened plate
[AD-A247922] p 3116 N92-27850

DIFFERENTIAL CALCULUS
Introduction to the differential geometry of quantum groups
[DE92-010476] p 3161 N92-27348

DIFFERENTIAL EQUATIONS
Investigation of battery charged capacitor pulsed power systems for electromagnetic launcher experiments
[AD-A247325] p 3089 N92-27353
Numerical treatment of differential and integral equations by the p and h-p versions of the finite element method
[AD-A247202] p 3158 N92-28189

DIFFERENTIAL GEOMETRY
Introduction to the differential geometry of quantum groups
[DE92-010476] p 3161 N92-27348
Boundary value problems on S(exp n) for surfaces of constant Gauss curvature
[PB92-134410] p 3158 N92-27909

DIFFUSION
Theory and application of random fields
[AD-A246958] p 3159 N92-27334
A method to determine moisture profiles from total moisture weight-gain data in polymeric composites
[AD-A247449] p 3077 N92-27550

DIFFUSION FLAMES
The coherent flamelet model for propulsion applications p 3073 N92-27486

DIGITAL DATA
Compression and decompression of digital seismic waveform data for storage and communication
[DE92-621016] p 3183 N92-27496
DoD implementation guidelines for Electronic Data Interchange (EDI), volume 1
[AD-A246613] p 3184 N92-27536
Software tools for acoustic database management
[AD-A247636] p 3181 N92-27553
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles
p 3031 N92-27890

An efficient method for three-dimensional route planning with different strategies and constraints
p 3033 N92-27901
Avionic data bus integration technology
[DOT/FAA/CT-91/19] p 3047 N92-27973
DIGITAL ELECTRONICS
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005
DIGITAL FILTERS
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434
Design of digital signal processing algorithms for enhancing the measurements of ultra-fast electromagnetic transients
[AD-A246269] p 3148 N92-27663
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785
Effects of non-normal outlier-prone error distribution on Kalman filter track
[AD-A247036] p 3162 N92-28146
DIGITAL SIMULATION
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005
DIGITAL SYSTEMS
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
Avionic data bus integration technology
[DOT/FAA/CT-91/19] p 3047 N92-27973
Dual frequency along-track interferometry
p 3088 N92-28024
DIGITAL TECHNIQUES
An efficient method for three-dimensional route planning with different strategies and constraints
p 3033 N92-27901
DIMENSIONAL MEASUREMENT
Development of a standard anthropometric dimension set for use in computer-aided glove design
[AD-A246272] p 3143 N92-27664
DIODES
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181
DIPLEXERS
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656
DIPOLES
Persistent circulation anomalies in observations and in a general circulation model
[ISBN-0-315-57198-5] p 3127 N92-27642
DIRECT CURRENT
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840
DIRECTIONAL CONTROL
Force analysis of magnetic bearings with power-saving controls p 3062 N92-27795
Fuzzy guidance system evaluation
p 3034 N92-27903
DISPERSING
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps
p 3193 N92-27256
DISPLACEMENT
Direct coupling of fluid structure in transonic aeroelasticity p 3040 N92-27954
DISPLAY DEVICES
Automated generation of three-dimensional virtual worlds for task explanation
[AD-A247859] p 3154 N92-27389
Experimental evaluation of candidate graphical microburst alert displays
[NASA-CR-189633] p 3047 N92-27424
Area-of-interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863
A teamwork model of pilot aiding: Psychological principles for mission management systems design
p 3032 N92-27893
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant
p 3032 N92-27895
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916
A prototype climate information system
[AD-A245352] p 3131 N92-28039
DISTRIBUTED PROCESSING
The multicomputer toolbox approach to concurrent BLAS and LACs
[DE92-010401] p 3146 N92-27391
Application of neural network to adaptive control theory for super-augmented aircraft
[AD-A246596] p 3050 N92-27505
Distributed ray casting for high-speed volume rendering
[AD-A248167] p 3150 N92-27868
DISTRIBUTION FUNCTIONS
The multicomputer toolbox approach to concurrent BLAS and LACs
[DE92-010401] p 3146 N92-27391
On the consequences of bi-Maxwellian distributions on parallel electric fields
[AD-A246206] p 3173 N92-27603
DIVERTERS
Structural materials for high-heat flux applications
[DE92-010253] p 3073 N92-27346
DOCUMENTATION
Documentation requirements for software maintenance
[AD-A246716] p 3151 N92-28069
DOCUMENTS
Improved classified material control through the application of a database management system
[AD-A245376] p 3180 N92-27440
DoD implementation guidelines for Electronic Data Interchange (EDI), volume 1
[AD-A246613] p 3184 N92-27536
Aeronautical engineering: A continuing bibliography with indexes (supplement 277)
[NASA-SP-7037(277)] p 3035 N92-27929
DOPED CRYSTALS
Heterostructure device useable as a far infrared photodetector --- semiconductor devices
[AD-D015217] p 3168 N92-27616
DOPPLER EFFECT
ALE frequency selection for Navy modems: Analysis
[AD-A247569] p 3083 N92-27564
DORNIER AIRCRAFT
NAL Dornier 228-200 flight research airplane: Present status and outline of the installed equipment
[NAL-TM-637] p 3045 N92-27429
DOSIMETERS
LDEF: Dosimetric measurement results (AO 138-7 experiment) p 3165 N92-27231
DOUBLE BASE PROPELLANTS
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161
DOUBLE SIDEBAND TRANSMISSION
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520
DRAG
Turbulence structure and polymer drag reduction in adverse pressure gradient boundary layers
[AD-A246651] p 3104 N92-27757
NACA0012 airfoil data corrected for sidewall boundary-layer effects in the NAL two-dimensional transonic wind tunnel
[NAL-TM-640T] p 3042 N92-28151
Note on flight measured control effectiveness of the quiet STOL experimental aircraft ASKA
[NAL-TR-1103] p 3051 N92-28154
DRAG REDUCTION
Special Course on Skin Friction Drag Reduction
[AGARD-R-786] p 3036 N92-27706
Basic concepts on boundary layers
p 3036 N92-27707
Drag reduction: An industrial challenge
p 3036 N92-27708
Aircraft drag reduction p 3036 N92-27709
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711
Study of turbulence structure through numerical simulations: The perspective of drag and reduction
p 3037 N92-27713
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
Turbulence structure and polymer drag reduction in adverse pressure gradient boundary layers
[AD-A246651] p 3104 N92-27757
DRILLING
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139
DROP TESTS
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139
DROPS (LIQUIDS)
Fundamental studies on droplet interactions in dense sprays
[AD-A246918] p 3101 N92-27546
Autoignition of single droplets of two-component liquid fuels
[CTN-92-60454] p 3071 N92-27634
DUAL SPIN SPACECRAFT
On the stability of a dual spin satellite with asymmetric rotor and flexible platform
[ISBN-0-315-54650-6] p 3056 N92-27613
DUCT GEOMETRY
Computational modelling of turbulent flow in S-bends
p 3099 N92-27480
DUCTED FLOW
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450
Time-marching methods for secondary flow analysis in curved ducts p 3095 N92-27454
Computational modelling of turbulent flow in S-bends
p 3099 N92-27480
Three dimensional flow in sharp bends --- ducted flow
p 3099 N92-27481
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
DUCTS
Unsteady Euler calculations in 3D internal aerodynamics p 3098 N92-27470
Numerical representation of heat transfer into turbine blade cooling ducts p 3098 N92-27474
Validation of non-orthogonal three-dimensional laminar flow predictions p 3098 N92-27476
Finite element solution of viscous compressible flows in gas turbine ducts and diffusers p 3099 N92-27477
Computational modelling of turbulent flow in S-bends
p 3099 N92-27480
DUST
Dust and sand forecasting in Iraq and adjoining countries
[AD-A247588] p 3129 N92-27551
Electromagnetic effects in Saturn's B ring
p 3193 N92-27637
DUST STORMS
Dust and sand forecasting in Iraq and adjoining countries
[AD-A247588] p 3129 N92-27551
DYES
Simple-reversible fiber-optic chemical sensors using solvatochromic dyes
[DE92-010441] p 3166 N92-27365
DYNAMIC CHARACTERISTICS
Investigation of dynamic algorithms for pattern recognition identified in cerebral cortex
[AD-A247860] p 3139 N92-27512
Computer graphics for bearing dynamic analysis
[AD-A247567] p 3148 N92-27584
Dynamic test apparatus for electro-rheological fluids
[AD-D015201] p 3106 N92-27823
DYNAMIC CONTROL
Dynamics and control of high precision magnetically levitated vibration isolation systems
p 3058 N92-27730
Neural networks modeling and control of dynamical systems p 3155 N92-27769
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
Development of telemetry for the agility flight test of a radio controlled fighter model
[AD-A248653] p 3055 N92-27994
DYNAMIC MODELS
Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-91-17] p 3133 N92-27547
DYNAMIC PROGRAMMING
An efficient method for three-dimensional route planning with different strategies and constraints
p 3033 N92-27901
DYNAMIC RESPONSE
Explicit solution of difference equation for the wavenumber response of fluid-loaded stiffened plate
[AD-A247922] p 3116 N92-27850
DYNAMIC STABILITY
Large-gap magnetic positioning system having advantageous configuration p 3065 N92-27814
DYNAMIC STRUCTURAL ANALYSIS
Identification of dynamic structures with special attention to damping matrix representation
[AD-A248020] p 3116 N92-27865
The benchmark aeroelastic models program: Description and highlights of initial results
p 3041 N92-27960
DYNAMIC TESTS
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819
Dynamic test apparatus for electro-rheological fluids
[AD-D015201] p 3106 N92-27823
DYNAMICAL SYSTEMS
Neural networks modeling and control of dynamical systems p 3155 N92-27769

E

EARLY WARNING SYSTEMS
Some advances in US space defense systems
[AD-A246038] p 3160 N92-27658

The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784

EARTH ATMOSPHERE
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168

EARTH CRUST
Wave propagation at regional distances
[AD-A246890] p 3126 N92-27380

EARTH MANTLE
Wave propagation at regional distances
[AD-A246890] p 3126 N92-27380

EARTH OBSERVATIONS (FROM SPACE)
ERS-1, the European Remote Sensing satellite: A central point of the German Earth observation program
[REPT-14/91] p 3118 N92-27408
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222

EARTH ORBITAL ENVIRONMENTS
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
LDEF's map experiment foil perforations yield hypervelocity impact penetration parameters p 3192 N92-27249
Hypervelocity impact facility for simulating materials exposure to impact by space debris p 3192 N92-27250
Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252
Elemental analyses of hypervelocity micro-particle impact sites on interplanetary dust experiment sensor surfaces p 3192 N92-27255
Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces p 3193 N92-27264
Modelling the near-Earth space environment using LDEF data p 3128 N92-27265
LDEF materials overview p 3068 N92-27269
LDEF materials data analysis: Representative examples p 3078 N92-27272
Long Duration Exposure Facility experiment M0003 deintegration observation database p 3078 N92-27273
Thermal Control Surfaces Experiment (TCSE) materials analysis p 3070 N92-27274
Selected results for LDEF thermal control coatings p 3078 N92-27277
Flouorescence measurements of the thermal control coatings on LDEF experiments S0069 and A0114 p 3078 N92-27278
Atomic oxygen effects on thermal control and mirror coatings: Evaluation of experiment A0034 p 3078 N92-27279
Stability and reactivity of dimethylethoxysilane p 3073 N92-27286
An ESR study of the UV degradation of FEP p 3079 N92-27287
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288
High-toughness graphite/epoxy composite material experiment p 3070 N92-27289
Space environmental effects on LDEF composites: Leading graphite/epoxy panel, selected trailing edge specimens p 3070 N92-27290
Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292
Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296
Contamination measurements on experiment M0003 p 3073 N92-27298
New results from FRECOPA analysis --- long duration exposure facility p 3111 N92-27304
Mechanisms flown on LDEF p 3111 N92-27305
Degradation of electro-optic components aboard LDEF --- long duration exposure facility p 3170 N92-27306
Degradation of optical components in a space environment p 3170 N92-27307
Optical characterization of contaminant film --- long duration exposure facility p 3170 N92-27308
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309
Holographic data storage crystals for the LDEF --- long duration exposure facility p 3178 N92-27313
Characterization of a space orbited incoherent fiber optic bundle --- long duration exposure facility p 3171 N92-27314
Analysis of space environment effects on active fiber optic links orbited aboard the LDEF --- long duration exposure facility p 3171 N92-27315
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment p 3178 N92-27318
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
The effect of the low Earth orbit environment on space solar cells: Results of the advanced photovoltaic experiment (S0014) p 3124 N92-27320
LEO effects on candidate solar cell cover materials p 3124 N92-27321
Continued results of the seeds in space experiment p 3136 N92-27323
The Canadian Space Agency, Space Station, Strategic Technologies for Automation and Robotics Program technology development activity in protection of materials from the low Earth orbit space environment p 3053 N92-27327
Future radiation measurements in low Earth orbit --- long duration exposure facility p 3166 N92-27329

EARTH ORBITS
Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292

EARTH RADIATION BUDGET
ARM review, 1991
[AD-A247629] p 3125 N92-27511

EARTHQUAKES
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908

ECOLOGY
Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036

ECONOMETRICS
Global climate change and international security
[DE92-010868] p 3125 N92-28056

ECONOMIC DEVELOPMENT
Business planning for scientists and engineers
[DE92-010381] p 3188 N92-28042

ECONOMICS
An assessment of the economic status of the antifriction bearing industry
[AD-A245373] p 3110 N92-27439

ECOSYSTEMS
Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991
[NASA-TM-107546] p 3136 N92-27877
Progress towards SAR based ecosystem analysis p 3119 N92-28014
Clean air act requirements for trace metals information
[PB92-164995] p 3125 N92-28206

EDDY CURRENTS
Edge effects on forces and magnetic fields produced by a conductor moving past a magnet
[DE92-010502] p 3161 N92-27411

EDDY VISCOSITY
The application of a Navier-Stokes CFD method to civil engine intake flows p 3098 N92-27471

EDGE DETECTION
A frontal approach for node generation in Delaunay triangulations p 3103 N92-27680

EDGES
Visual processing in texture segregation
[AD-A247173] p 3142 N92-28176

EDITING
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages p 3149 N92-27831

EDUCATION
An educational space seminar to increase American student interest in space careers
[AD-A246565] p 3179 N92-27499
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 13: Wright Laboratory
[AD-A248776] p 3218 N92-28078
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) repoorts. Volume 10: Armstrong Laboratory
[AD-A248773] p 3218 N92-28097
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 11: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248774] p 3219 N92-28098
United States Air Force Summer Research program 1991. High School Apprenticeship Program (HSAP) reports. Volume 12: Rome Laboratory, Arnold Engineering Development Center
[AD-A248775] p 3219 N92-28099
An experimental study in the use of computer-based instruction to teach automated spreadsheet functions
[AD-A246728] p 3152 N92-28104
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 15: Technical communications in the international workplace: Some implications for curriculum development
[NASA-TM-107926] p 3186 N92-28116
Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144

EGRESS
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750

EINSTEIN EQUATIONS
Solutions of Einstein's equations having functionally separable metrics
[ISBN-0-315-60751-3] p 3179 N92-27688

ELASTIC DEFORMATION
Silicon-on-insulator photonics
[AD-A247957] p 3091 N92-27847

ELASTIC SCATTERING
The neutron-deuteron in hyperspherical formalism
[BONN-IR-91-13] p 3163 N92-27421

ELASTIC WAVES
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields p 3060 N92-27746

ELECTRIC BATTERIES
Investigation of battery charged capacitor pulsed power systems for electromagnetic launcher experiments
[AD-A247325] p 3089 N92-27353
Battery cars on superconducting magnetically levitated carriers: One commuting solution p 3065 N92-27811

ELECTRIC CHARGE
Electrically actuated multiple store launcher
[AD-D015247] p 3054 N92-27374
Numerical simulation of the function of scientific instrumentation for measuring the speed of electron devices
[AD-A247006] p 3093 N92-28137

ELECTRIC CONDUCTORS
Edge effects on forces and magnetic fields produced by a conductor moving past a magnet
[DE92-010502] p 3161 N92-27411

ELECTRIC CORONA
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513

ELECTRIC CURRENT
Force analysis of magnetic bearings with power-saving controls p 3062 N92-27795
All-optical fiber Faraday rotation current sensor with heterodyne detection technique
[AD-D015226] p 3170 N92-28001

ELECTRIC FIELD STRENGTH
On the consequences of bi-Maxwellian distributions on parallel electric fields
[AD-A246206] p 3173 N92-27603

ELECTRIC FIELDS
An 11-CM full-matrix polarimetric radar for meteorological research
[AD-A246893] p 3082 N92-27506
Evaluation of method of moments codes: University of Houston junction and numerical electromagnetic code
[AD-A247570] p 3083 N92-27565
On the consequences of bi-Maxwellian distributions on parallel electric fields
[AD-A246206] p 3173 N92-27603
Location and characterization of in-cloud lightning currents by multiple station VHF and electric field measurements
[AD-A247051] p 3131 N92-27988
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data
[AD-A248377] p 3085 N92-28003
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122

ELECTRIC GENERATORS
A simplified nonlinear model for a Combined Heat and Power (CHP) system
[RR-416] p 3081 N92-27926

ELECTRIC MOTOR VEHICLES
Heavy duty transport research needs assessment
[DE92-010622] p 3109 N92-27394

ELECTRIC MOTORS
Precision magnetic suspension linear bearing p 3057 N92-27727

ELECTRIC POTENTIAL
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513

ELECTRIC POWER PLANTS
Emissions trading and compliance: Regulatory incentives and barriers
[DE92-010280] p 3125 N92-27571

ELECTRIC SWITCHES
Space division switches based on semiconductor optical amplifiers
[AD-A247619] p 3176 N92-27598
Space-division optical switches based on semiconductor optical amplifiers
[AD-A247616] p 3167 N92-27608
ELECTRICAL FAULTS
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513
ELECTRICAL GROUNDING
Oxygen isotopes implanted in the LDEF spacecraft
p 3165 N92-27284
ELECTRICAL IMPEDANCE
DC uninterrupted power supply having instantaneous switching followed by low impedance switching
[AD-D015206] p 3089 N92-27398
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840
ELECTRICAL INSULATION
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer
[AD-A248164] p 3077 N92-27867
ELECTRICAL MEASUREMENT
Location and characterization of in-cloud lightning currents by multiple station VHF and electric field measurements
[AD-A247051] p 3131 N92-27988
ELECTRICITY
Emissions trading and compliance: Regulatory incentives and barriers
[DE92-010280] p 3125 N92-27571
The use of electrical transmission line theory to predict the performance of spacecraft radiators
[AD-A247786] p 3091 N92-27861
ELECTRO-OPTICS
Degradation of electro-optic components aboard LDEF --- long duration exposure facility p 3170 N92-27306
Integrated optical pipelined polynomial processors
[AD-A248573] p 3092 N92-27992
ELECTROACOUSTIC TRANSDUCERS
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513
ELECTRODEPOSITION
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer
[AD-A248164] p 3077 N92-27867
ELECTRODES
Lithium rechargeable cell with a polymer cathode
[AD-A247577] p 3090 N92-27567
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer
[AD-A248164] p 3077 N92-27867
Atomic-level structure and dynamics of ordered metal electrodes as probed by infrared spectroscopy and scanning tunneling microscopy
[AD-A246738] p 3164 N92-28105
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120
ELECTRODYNAMICS
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields
p 3060 N92-27746
ELECTROLYSIS
The application of chaos theory to an alumina sensor for aluminum reduction cells
[DE92-010630] p 3089 N92-27395
ELECTROLYTES
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120
ELECTROLYTIC CELLS
The application of chaos theory to an alumina sensor for aluminum reduction cells
[DE92-010630] p 3089 N92-27395
Lithium rechargeable cell with a polymer cathode
[AD-A247577] p 3090 N92-27567
ELECTROMAGNETIC ABSORPTION
Physics and diagnostics of laser ablation plume propagation for high-(Tc) superconductor film growth
[DE92-009386] p 3171 N92-27362
ELECTROMAGNETIC ACCELERATION
Investigation of battery charged capacitor pulsed power systems for electromagnetic launcher experiments
[AD-A247325] p 3089 N92-27353
ELECTROMAGNETIC COMPATIBILITY
JTIDS electromagnetic compatibility in the 960-1215 MHz band
[AD-A247834] p 3085 N92-27864
ELECTROMAGNETIC FIELDS
Design of digital signal processing algorithms for enhancing the measurements of ultra-fast electromagnetic transients
[AD-A246269] p 3148 N92-27663
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data
[AD-A248377] p 3085 N92-28003
Kolmogorov spectra in a finite pressure plasma
[DE92-621531] p 3174 N92-28044
Radiation, scattering, and guidance of electromagnetic fields by arbitrarily shaped structures embedded in layered dielectric media
[AD-A248951] p 3085 N92-28066
ELECTROMAGNETIC INTERACTIONS
A sophisticated cad tool for the creation of complex models for electromagnetic interaction analysis
[AD-A245936] p 3085 N92-27858
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
Estimation of oblique electroweak corrections
[DE92-010742] p 3179 N92-28160
ELECTROMAGNETIC PROPULSION
Change in the coil distribution of electrodynamic suspension system p 3064 N92-27806
Computation of magnetic suspension of maglev systems using dynamic circuit theory p 3065 N92-27813
ELECTROMAGNETIC PULSES
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659
Design of digital signal processing algorithms for enhancing the measurements of ultra-fast electromagnetic transients
[AD-A246269] p 3148 N92-27663
Nonlinear effects in optical fibers
p 3086 N92-28088
The electromagnetic pulse environment and its influence on tactical electronic and communications equipment
[AD-A246754] p 3087 N92-28129
ELECTROMAGNETIC RADIATION
Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A246399] p 3162 N92-27751
Fluctuations and squeezing in resonance fluorescence emitted near a phase conjugator
[AD-A248735] p 3170 N92-28125
ELECTROMAGNETIC WAVE FILTERS
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656
ELECTROMAGNETISM
Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559
A new composite roughness surface scattering model
[AD-A248891] p 3085 N92-27970
ELECTROMAGNETS
Large-gap magnetic suspension systems
p 3057 N92-27724
Modelling and design for PM/EM magnetic bearings
p 3057 N92-27728
ELECTROMECHANICAL DEVICES
Silicon-on-insulator photonics
[AD-A247957] p 3091 N92-27847
ELECTROMECHANICS
An electrostatically suspended, micro-mechanical rate gyroscope p 3064 N92-27810
ELECTRON BOMBARDMENT
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835
ELECTRON DIFFUSION
JPRS report: Science and technology. Central Eurasia: Space
[JPRS-USP-92-001] p 3053 N92-27931
ELECTRON ENERGY
Electromagnetic semi-local kinetic analysis on the electron temperature gradient mode in tokamaks
[PPL-118] p 3173 N92-27581
ELECTRON GAS
Numerical simulation of the function of scientific instrumentation for measuring the speed of electron devices
[AD-A247006] p 3093 N92-28137
ELECTRON GUNS
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835
ELECTRON IRRADIATION
Effects of high energy electron irradiation on a yttrium barium(2) copper(3) oxygen(7-delta) high temperature superconductor
[AD-A246895] p 3177 N92-27983
ELECTRON MICROSCOPY
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps
p 3193 N92-27256
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257
Scanning tunneling microscopy of the organic semiconductor ((eta-C5Me5) 2Ru(1,4-(2(2))-cyclophane)) (TCNQ)4
[AD-A246848] p 3093 N92-28121
ELECTRON MOBILITY
Development of a Ge/GaAs HMT technology based on plasma enhanced chemical vapor deposition
[AD-A246991] p 3176 N92-27381
ELECTRON PHONON INTERACTIONS
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869
ELECTRON SCATTERING
Electron interactions with non-linear polyatomic molecules and their radicals and ions
[AD-A246492] p 3163 N92-27210
ELECTRON STATES
Scanning tunneling microscopy of the organic conductors (TMTSF)2X(X = C1O4-, REO4-)
[AD-A246909] p 3168 N92-27720
ELECTRON TRANSITIONS
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835
ELECTRONIC COUNTERMEASURES
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
ELECTRONIC EQUIPMENT
Applications of high speed networks
[AD-A246082] p 3153 N92-27525
Quantum devices
[AD-A247795] p 3177 N92-27705
Enhancement of boiling heat transfer in di-electric fluids
[AD-A245962] p 3105 N92-28058
The electromagnetic pulse environment and its influence on tactical electronic and communications equipment
[AD-A246754] p 3087 N92-28129
Numerical simulation of the function of scientific instrumentation for measuring the speed of electron devices
[AD-A247006] p 3093 N92-28137
ELECTRONIC FILTERS
Stability and performance of notch filter control for unbalance response p 3058 N92-27731
ELECTRONIC PACKAGING
Investigations of the seafloor coupling characteristics of the new ONR OBS and related questions
[AD-A246241] p 3131 N92-27199
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging
[AD-A246429] p 3088 N92-27204
ELECTRONIC WARFARE
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785
ELECTRONS
Measurements of the radiation dose to LDEF by means of passive dosimetry p 3165 N92-27230
Phenomena unique to sub-micrometer devices
[AD-A246655] p 3091 N92-27759
Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004
ELECTROPHYSIOLOGY
The effects of hydrazines on neuronal excitability
[AD-A247103] p 3137 N92-27844
ELECTRORHEOLOGICAL FLUIDS
Dynamic test apparatus for electro-rheological fluids
[AD-D015201] p 3106 N92-27823
ELECTROSTATIC PROBES
A self-zeroing capacitance probe for water wave measurements
[NASA-RP-1278] p 3135 N92-27930

Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004

ELECTROSTATICS
Local kinetic analysis of low frequency electrostatic modes in tokamaks
[PPL-110] p 3172 N92-27449
Electromagnetic effects in Saturn's B ring
p 3193 N92-27637

ELEVATION
A self-zeroing capacitance probe for water wave measurements
[NASA-RP-1278] p 3135 N92-27930

ELEVATORS (LIFTS)
On minimising noise problems caused by passenger lifts in studio centres
[BBC-RD-1992/2] p 3087 N92-28101

ELLIPSOIDS
Datums, ellipsoids, grids, and grid reference systems
[AD-A247651] p 3118 N92-27554

ELLIPTICAL GALAXIES
Turbulent cooling flows in galaxies and clusters
[ISBN-0-315-61634-2] p 3191 N92-27699

EMERGENCIES
A conceptual design for the Telecommunications Emergency Decision Support System (TEDSS)
[AD-A246045] p 3083 N92-27660
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750

EMISSION SPECTRA
Spectral properties of a novel laser crystal Y3(In, Ga)2Ga3O12:Cr3(+)
[AD-A246254] p 3175 N92-27201
Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region
[AD-A248612] p 3072 N92-28064

EMITTANCE
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A246399] p 3162 N92-27751

EMITTERS
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640
Low capacitance field emitter array and method of manufacture therefor
[AD-D015225] p 3092 N92-28000

END EFFECTORS
Automated assembly of large space structures
p 3156 N92-27774
Development of a machine vision guidance system for automated assembly of space structures
p 3156 N92-27775
End-effector microprocessor p 3145 N92-27776

END PLATES
Radioactivities induced in some LDEF samples
p 3164 N92-27225

ENERGY BANDS
Heterostructure device useable as a far infrared photodetector --- semiconductor devices
[AD-D015217] p 3168 N92-27616

ENERGY BUDGETS
Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543

ENERGY CONSUMPTION
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
Force analysis of magnetic bearings with power-saving controls p 3062 N92-27795

ENERGY CONVERSION
Investigation of a heat driven thermoacoustic prime mover above onset of self-oscillation
[AD-A246257] p 3162 N92-27202

ENERGY CONVERSION EFFICIENCY
Application of CFD in the design of gas turbine engine components p 3049 N92-27461

ENERGY DISSIPATION
Experimental investigation of energy dissipation in finite-amplitude standing waves
[AD-A246428] p 3109 N92-27203

ENERGY DISTRIBUTION
Study of the charge and energy distributions of low-energy particles of cosmic radiation in the near-earth orbit by the method of controllable nuclear emulsion
[DE92-620924] p 3195 N92-27494

ENERGY POLICY
Heavy duty transport research needs assessment
[DE92-010622] p 3109 N92-27394

ENERGY REQUIREMENTS
Design of fast earth-return trajectories from a lunar base
[AD-A246553] p 3053 N92-27530
Metabolic energy requirements for space flight
[NASA-TM-107933] p 3138 N92-28212

ENERGY SPECTRA
A photon-phreak digs the LDEF happening
p 3164 N92-27226
Light-heavy ion measurements in CR-39 located on the Earth side of LDEF p 3165 N92-27234
Ultra heavy cosmic ray experiment (A0178)
p 3196 N92-27241

ENERGY STORAGE
Development of a differentially balanced magnetic bearing and control system for use with a flywheel energy storage system p 3062 N92-27798
Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update
[NASA-TM-105689] p 3067 N92-27878

ENERGY TRANSFER
Experimental investigation of energy dissipation in finite-amplitude standing waves
[AD-A246428] p 3109 N92-27203
Presentation of a computational code for 3-D compressible flow in complex channels and cavities
p 3098 N92-27475
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers
[AD-A246037] p 3108 N92-27657

ENGINE CONTROL
Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility
[NASA-TM-4394] p 3048 N92-27379

ENGINE DESIGN
Users manual and modeling improvements for axial turbine design and performance computer code TD2-2
[NASA-CR-189118] p 3035 N92-27376
Application of CFD in the design of gas turbine engine components p 3049 N92-27461
Feasibility of magnetic bearings for advanced gas turbine engines p 3059 N92-27738

ENGINE FAILURE
The relationship between fuel lubricity and diesel injection system wear
[AD-A247927] p 3110 N92-27851

ENGINE INLETS
The application of a Navier-Stokes CFD method to civil engine intake flows p 3098 N92-27471
Computational modelling of turbulent flow in S-bends
p 3099 N92-27480

ENGINE PARTS
Ceramic composites: Enabling aerospace materials
[NASA-TM-105599] p 3076 N92-27378
Thermally sprayed coating systems for surface protection and clearance control applications in aero engines
[PNR-90802] p 3048 N92-27422
Engine structures modeling software system: Computer code. User's manual
[NASA-CR-189154] p 3116 N92-27872
An appraisal of cost-effectiveness models used in the Air Force and Navy aircraft engine component improvement programs
[AD-A245910] p 3049 N92-28162

ENGINEERING DRAWINGS
NPSNET: Physically-based modeling enhancements to an object file format
[AD-A246594] p 3146 N92-27504

ENGINEERING MANAGEMENT
Profile of an effective engineering manager
[AD-A246525] p 3180 N92-27528

ENGINES
Experimental investigation of energy dissipation in finite-amplitude standing waves
[AD-A246428] p 3109 N92-27203

ENTRAINMENT
Turbulence structure and polymer drag reduction in adverse pressure gradient boundary layers
[AD-A246651] p 3104 N92-27757

ENTROPY
Finite element methods for fluids
p 3102 N92-27673
An investigation of the information propagation and entropy transport aspects of Stirling machine numerical simulation
[NASA-CR-189143] p 3105 N92-27975

ENVIRONMENT EFFECTS
Selected results for LDEF thermal control coatings
p 3078 N92-27277
Space environmental effects on LDEF composites: Leading graphite/epoxy panel, selected trailing edge specimens p 3070 N92-27290
Characterization of a space orbited incoherent fiber optic bundle --- long duration exposure facility
p 3171 N92-27314
Analysis of space environment effects on active fiber optic links orbited aboard the LDEF --- long duration exposure facility p 3171 N92-27315
The effect of the low Earth orbit environment on space solar cells: Results of the advanced photovoltaic experiment (S0014) p 3124 N92-27320
LEO effects on candidate solar cell cover materials
p 3124 N92-27321
Final results of the Space Exposed Experiment Developed for Students (SEEDS) P-0004-2
p 3136 N92-27322
Continued results of the seeds in space experiment
p 3136 N92-27323
LDEF archival system plan p 3188 N92-27324
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
Global climate change and international security
[DE92-010868] p 3125 N92-28056
Air pollution effects on biodiversity
[PB92-170166] p 3125 N92-28208

ENVIRONMENT MODELS
Modelling the near-Earth space environment using LDEF data p 3128 N92-27265
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382
Three-dimensional Ocean Thermal Structure (TOTS) software module software requirements specifications
[AD-A246146] p 3134 N92-27575

ENVIRONMENT PROTECTION
High-solids and 100-percent solids coatings: A state-of-the-art investigation
[AD-A247557] p 3076 N92-27539
Clean air act requirements for trace metals information
[PB92-164995] p 3125 N92-28206
Air pollution effects on biodiversity
[PB92-170166] p 3125 N92-28208

ENVIRONMENT SIMULATION
Hypervelocity impact facility for simulating materials exposure to impact by space debris
p 3192 N92-27250

ENVIRONMENTAL CHEMISTRY
Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292

ENVIRONMENTAL MONITORING
Clean air act requirements for trace metals information
[PB92-164995] p 3125 N92-28206

ENVIRONMENTAL TESTS
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
Elemental analyses of hypervelocity micro-particle impact sites on interplanetary dust experiment sensor surfaces p 3192 N92-27255
Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces
p 3193 N92-27264
LDEF materials overview p 3068 N92-27269
LDEF materials data analysis: Representative examples p 3078 N92-27272
Long Duration Exposure Facility experiment M0003 deintegration observation database
p 3078 N92-27273
Thermal Control Surfaces Experiment (TCSE) materials analysis p 3070 N92-27274

ENVIRONMENTS
An experimental study in the use of computer-based instruction to teach automated spreadsheet functions
[AD-A246728] p 3152 N92-28104

ENZYMES
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

EPITAXY
Passivation and gating of GaAs and Si surfaces using pseudomorphic structures
[AD-A246990] p 3176 N92-27402

EPOXY MATRIX COMPOSITES
LDEF polymeric materials: 10 months versus 5.8 years of exposure p 3079 N92-27282
Evaluation of long-duration exposure to the natural space environment on the mechanical properties of carbon-reinforced epoxy and polyimide composites
p 3070 N92-27291

EPOXY RESINS
High energy explosive yield enhancer using microencapsulation
[AD-D015195] p 3080 N92-27492
Bislactone curing agents for epoxy resins and polymers obtained therefrom
[AD-D015221] p 3077 N92-27618

EQUATORIAL REGIONS
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515

ERGODIC PROCESS
Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661

EROSIVE BURNING
Erosion in a 20-mm-gun produced by normal and LOVA propellant charges
[ISL-CO-215/89] p 3080 N92-27927
ERROR ANALYSIS
Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
Exponential error bounds on codes for noisy channels with inaccurately known statistics and for generalized decision rules
[AD-A246064] p 3158 N92-27834
Form error models of the NIST algorithm testing system
[PB92-172014] p 3150 N92-27923
Effects of non-normal outlier-prone error distribution on Kalman filter track
[AD-A247036] p 3162 N92-28146
Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210
ERROR SIGNALS
Performance of a fast frequency-hopped noncoherent MFSK receiver with ratio-statistic combining over Rician fading channels with partial-band interference
[AD-A247034] p 3082 N92-27339
ERRORS
An empirical study of fault detection by static units-consistency analysis
[AD-A247592] p 3147 N92-27569
Variable hold time in dynamic random access memories
[AD-A246602] p 3144 N92-28063
Effects of non-normal outlier-prone error distribution on Kalman filter track
[AD-A247036] p 3162 N92-28146
ERS-1 (ESA SATELLITE)
ERS-1, the European Remote Sensing satellite: A central point of the German Earth observation program
[REPT-14/91] p 3118 N92-27408
ESCAPE SYSTEMS
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750
ESSENTIALLY NON-OSCILLATORY SCHEMES
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes
p 3103 N92-27678
ESTERS
Precomplexation and activation of carboxylate and phosphate esters
[AD-A247778] p 3077 N92-27704
ESTIMATES
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications
p 3037 N92-27937
Conditions for the applicability of the regenerative method
[AD-A248598] p 3160 N92-28182
ESTIMATING
The carcinogenic risks of low-LET and high-LET ionizing radiations
[DE92-010477] p 3136 N92-27349
Approximate confidence limit procedures for complex systems
[AD-A247253] p 3159 N92-27384
Search route planning p 3033 N92-27900
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019
Gradient estimation for ratios
[AD-A248453] p 3160 N92-28140
Estimating the reliability of a system on the basis of sample paths
[AD-A248585] p 3115 N92-28171
ETCHING
Low capacitance field emitter array and method of manufacture therefor
[AD-D015225] p 3092 N92-28000
EULER EQUATIONS OF MOTION
On the computation of unsteady turbomachinery flows. Part 1: Euler equations in vibrating cascades
p 3096 N92-27460
Unsteady Euler calculations in 3D internal aerodynamics p 3098 N92-27470
Nonequilibrium 3D flows of air through inlets
p 3100 N92-27487
Unstructured grid methods for compressible flows
p 3103 N92-27676
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations
p 3103 N92-27677
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations
p 3039 N92-27945
EUROPEAN SPACE AGENCY
Management of the Space Physics Analysis Network (SPAN)
[NASA-TM-107934] p 3187 N92-28188
EVACUATING (TRANSPORTATION)
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750
EVALUATION
The metrics handbook
[AD-A248591] p 3081 N92-28180
EVANESCENCE
Simple-reversible fiber-optic chemical sensors using solvatochromic dyes
[DE92-010441] p 3166 N92-27365
EVAPOTRANSPIRATION
Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543
EVOKED RESPONSE (PSYCHOPHYSIOLOGY)
Spatio-temporal masking: Hyperacuity and local adaptation
[AD-A246953] p 3138 N92-27331
Stress-induced enhancement of the startle reflex
[AD-A247096] p 3140 N92-27839
EXCIMERS
Nuclear-driven flashlamp pumping of the atomic iodine laser
[DE92-010609] p 3107 N92-27393
EXHAUST NOZZLES
Application of CFD in the design of gas turbine engine components p 3049 N92-27461
Experimental performance of three design factors for ventral nozzles for SSTOVL aircraft
[NASA-TM-105697] p 3049 N92-27669
EXOBIOLOGY
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 361)
[NASA-SP-7011(361)] p 3137 N92-27433
EXPECTATION
The influence of subject expectation on visual accommodation in the dark
[AD-A245923] p 3142 N92-28164
EXPERIMENT DESIGN
Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734
EXPERIMENTATION
A microgravity vibration isolation rig
p 3060 N92-27745
EXPERT SYSTEMS
Expert System Development (ESD) shell
[DE92-621018] p 3184 N92-27497
Determining rules for closing customer service centers: A public utility company's fuzzy decision
[NASA-CR-190390] p 3181 N92-27572
Integrated multi-domain radar demonstration
[AD-A246653] p 3084 N92-27758
Executive system software design and expert system implementation p 3152 N92-27778
An expert system for measuring, interpreting, and managing system performance factors for the work information management system
[AD-A246878] p 3182 N92-27824
Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
Situation assessment in the Paladin tactical decision generation system p 3032 N92-27892
Parallel knowledge based systems architectures for in-flight mission management p 3034 N92-27904
Knowledge-based natural language understanding: A AAAI-87 survey talk
[AD-A249120] p 3151 N92-28068
Research into the design and implementation of knowledge-base system
[AD-A247039] p 3151 N92-28075
EXPLORER SATELLITES
Communication analysis for the expendable explorer spacecraft
[NASA-CR-189273] p 3083 N92-27516
EXPLOSIVES
High energy explosive yield enhancer using microencapsulation
[AD-D015195] p 3080 N92-27492
EXPOSURE
Atomic oxygen effects on LDEF experiment A0171
p 3079 N92-27280
Surface analyses of composites exposed to the space environment on LDEF p 3070 N92-27293
Evaluation of seals, lubricants, and adhesives used on LDEF p 3111 N92-27299
Effects of long term space environment exposure on optical substrates and coatings (S0050-2)
p 3170 N92-27310
The effects of hydrazines on neuronal excitability
[AD-A247103] p 3137 N92-27844
EXTERNAL STORES
Electrically actuated multiple store launcher
[AD-D015247] p 3054 N92-27374
EXTRAGALACTIC RADIO SOURCES
Examination of selected jets of extragalactic radio sources
[ETN-92-90827] p 3195 N92-27405
EXTRAPOLATION
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434
EXTRATERRESTRIAL ENVIRONMENTS
Second LDEF Post-Retrieval Symposium abstracts
[NASA-CP-10097] p 3196 N92-27218
EXTRATERRESTRIAL RADIATION
A photon-phreak digs the LDEF happening
p 3164 N92-27226
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
Future radiation measurements in low Earth orbit --- long duration exposure facility p 3166 N92-27329
Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594
EXTRAVEHICULAR ACTIVITY
EVA robotics for Space Station Freedom: Dextrous Manipulator Development (DEMAND)
p 3155 N92-27765
EYE (ANATOMY)
The influence of subject expectation on visual accommodation in the dark
[AD-A245923] p 3142 N92-28164

F

F-15 AIRCRAFT
Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility
[NASA-TM-4394] p 3048 N92-27379
Add-on damping treatment for life extension of the F-15 upper-outer wing skin
[AD-A246149] p 3050 N92-27577
Aeroelastic calculations for fighter aircraft using the transonic small disturbance equation
p 3040 N92-27951
FABRICATION
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers
[DE92-010449] p 3069 N92-27856
Glass sample preparation and performance investigations --- solar x-ray imager
[NASA-CR-190399] p 3169 N92-27871
Low capacitance field emitter array and method of manufacture therefor
[AD-D015225] p 3092 N92-28000
Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004
The design, development, and test of balloonborne and groundbased lidar systems. Volume 2: Flight test of Atmospheric Balloon Lidar Experiment, ABLE 2
[AD-A246727] p 3087 N92-28103
Model A: High-temperature tribometer
[AD-A249258] p 3107 N92-28217
FABRICS
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
Fabric-stress-deformation relations in granular materials
[AD-A247009] p 3117 N92-28138
Thermal resistance values of some protective clothing ensembles
[AD-A245937] p 3144 N92-28166
FACTORIAL DESIGN
An analysis of fixed wing tactical airlifter characteristics using an intra-theater airlift computer model
[AD-A246908] p 3045 N92-27719
FAILURE
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627
Determination of minimum adherend thickness for climbing drum and floating roller adhesive tests
[AD-A248883] p 3111 N92-27996
FAILURE ANALYSIS
Advanced baffle materials technology development
[AD-A247935] p 3169 N92-27826
FAILURE MODES
Experimental validation of clock synchronization algorithms
[NASA-TP-3209] p 3153 N92-27589

FAINT OBJECTS
Clustering of faint galaxies
[ISBN-0-315-53743-4] p 3189 N92-27686
FAR INFRARED RADIATION
Heterostructure device useable as a far infrared photodetector --- semiconductor devices
[AD-D015217] p 3168 N92-27616
FARADAY EFFECT
All-optical fiber Faraday rotation current sensor with heterodyne detection technique
[AD-D015226] p 3170 N92-28001
FARM CROPS
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site
p 3120 N92-28018
FASTENERS
Development of a truss joint for robotic assembly of space structures
[NASA-TP-3214] p 3117 N92-27974
FATIGUE (MATERIALS)
Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318
[DE92-009408] p 3117 N92-28041
FATIGUE LIFE
Visit to CALTECH and CERRA/ICASP6 reliability conference
[AD-A246432] p 3159 N92-27205
Fatigue life improvement of an autofrettage thick-walled pressure vessel with an external groove
[AD-A247233] p 3115 N92-27213
Development of the microstructure based stochastic life prediction models
[AD-A246447] p 3074 N92-27821
Life prediction methodologies for composite materials
[AD-A248637] p 3070 N92-28202
FATIGUE TESTING MACHINES
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies
[NASA-TM-105416] p 3111 N92-27879
FATIGUE TESTS
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C
[AD-A246407] p 3069 N92-27752
FAULT TOLERANCE
Fault tolerant real-time systems
[AD-A246644] p 3154 N92-27755
FEAR
Stress-induced enhancement of the startle reflex
[AD-A247096] p 3140 N92-27839
FEASIBILITY ANALYSIS
The Canadian Space Agency, Space Station, Strategic Technologies for Automation and Robotics Program technology development activity in protection of materials from the low Earth orbit space environment
p 3053 N92-27327
Human-powered helicopter: A program for design and construction
[AD-A246821] p 3142 N92-27350
Four-dimensional interconnect experimental development
[AD-A247287] p 3106 N92-27385
Communication analysis for the expendable explorer spacecraft
[NASA-CR-189273] p 3083 N92-27516
Active magnetic bearings: As applied to centrifugal pumps p 3057 N92-27726
Feasibility of magnetic bearings for advanced gas turbine engines p 3059 N92-27738
The mechanical properties of metal-void composites --- pressurized microvoids
[AD-A246087] p 3069 N92-27749
FEDERAL BUDGETS
FY 1992/1993 biennial RDT and E descriptive summaries: DARPA. Amended
[AD-A247452] p 3218 N92-27593
Improving the impact of Federal scientific and technical information: A call for action p 3186 N92-28149
FEEDBACK
Effects of subordinate feedback to the supervisor and participation in decision-making in the prediction of organizational support
[AD-A249125] p 3183 N92-28083
Amplification and damping of synchrotron oscillations via a parametric process
[DE92-010748] p 3166 N92-28174
FEEDBACK CONTROL
Antenna pointing system mounted on a flexible space structure
[NAL-TR-1119] p 3110 N92-27432
Stability and performance of notch filter control for unbalance response p 3058 N92-27731
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782
Design of bearings for rotor systems based on stability p 3063 N92-27799
Self-adaptive aeropropulsion components-enhancing axial compressor performance
[AD-A246123] p 3049 N92-27817
FEMALES
Gender, equity, and job satisfaction
[AD-A246588] p 3139 N92-27501
FERMIONS
The Cornwall-Norton model in the strong coupling regime
[DE92-621061] p 3164 N92-27498
FERROELECTRICITY
Research in high dielectric properties of ferroelectric materials
[AD-A246899] p 3177 N92-27985
FERROMAGNETIC FILMS
Magneto-optical studies of ultrathin ferromagnetic films
[DE92-010252] p 3176 N92-27345
FERROMAGNETIC MATERIALS
Magneto-optical studies of ultrathin ferromagnetic films
[DE92-010252] p 3176 N92-27345
Wide gap, permanent magnet biased magnetic bearing system p 3062 N92-27794
FERROMAGNETISM
Manipulation and identification of objects by magnetic forces p 3062 N92-27796
FEYNMAN DIAGRAMS
Perturbation theory in light-cone quantization
[DE92-011076] p 3167 N92-27419
FIBER COMPOSITES
LDEF polymeric materials: 10 months versus 5.8 years of exposure p 3079 N92-27282
Demonstration of manufacturing process for large area, multilayer piezoelectric composites
[AD-A246662] p 3069 N92-27761
Life prediction methodologies for composite materials
[AD-A248637] p 3070 N92-28202
FIBER OPTICS
Characterization of a space orbited incoherent fiber optic bundle --- long duration exposure facility
p 3171 N92-27314
Analysis of space environment effects on active fiber optic links orbited aboard the LDEF --- long duration exposure facility p 3171 N92-27315
Radiation and temperature effects on LDEF fiber optic cable samples --- long duration exposure facility
p 3171 N92-27316
Local area networks with fiber optics
[AD-A247033] p 3166 N92-27338
Simple-reversible fiber-optic chemical sensors using solvatochromic dyes
[DE92-010441] p 3166 N92-27365
High pressure fiber optic connector plug
[AD-D015246] p 3166 N92-27373
Design and implementation of a fiber optic token-ring local area network
[AD-A245364] p 3167 N92-27435
Applications of high speed networks
[AD-A246082] p 3153 N92-27525
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[UTIAS-337] p 3116 N92-27633
Fiber-optic remote angular position sensor including a polarization track
[AD-D015210] p 3169 N92-27838
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007
Advances in Fibre-Optic Technology in Communications and for Guidance and Control
[AGARD-LS-184] p 3086 N92-28084
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085
Coherent communications --- fiber optics applications
p 3086 N92-28086
High speed local area networks p 3086 N92-28087
Nonlinear effects in optical fibers
p 3086 N92-28088
Active fibres and optical amplifiers
p 3086 N92-28089
Optical fiber sensors p 3086 N92-28090
Smart structures: The relevance of fibre optics
p 3086 N92-28091
Fiber-optic gyroscope p 3087 N92-28092
Fiber optic data busses for aircraft
p 3048 N92-28093
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[ISBN-0-315-59931-6] p 3117 N92-28158
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181
FIBER VOLUME FRACTION
The mechanical properties of metal-void composites --- pressurized microvoids
[AD-A246087] p 3069 N92-27749
FIELD EFFECT TRANSISTORS
Passivation and gating of GaAs and Si surfaces using pseudomorphic structures
[AD-A246990] p 3176 N92-27402
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656
FIELD STRENGTH
Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734
FIELD THEORY (PHYSICS)
Estimation of oblique electroweak corrections
[DE92-010742] p 3179 N92-28160
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
FIGHTER AIRCRAFT
Pivoting seat for fighter aircraft
[AD-D015244] p 3143 N92-27372
The advanced tactical fighter early, structured, and continuous user-interface process: A system program office/user team-building concept
[AD-A246641] p 3182 N92-27754
ICAAS piloted simulation evaluation
p 3034 N92-27906
Unsteady aerodynamics for aeroelasticity at the Flight Dynamics Directorate p 3038 N92-27939
Aeroelastic calculations for fighter aircraft using the transonic small disturbance equation
p 3040 N92-27951
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
p 3041 N92-27958
Transonic wind tunnel investigation of limit cycle oscillations on fighter type wings p 3041 N92-27959
Development of telemetry for the agility flight test of a radio controlled fighter model
[AD-A248653] p 3055 N92-27994
FILE MAINTENANCE (COMPUTERS)
The EPSA to PATRAN interface
[AD-A246489] p 3145 N92-27208
FILM COOLING
Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades
p 3095 N92-27456
Heat transfer, adiabatic effectiveness and injectant distributions downstream of single and double rows of film-cooling holes with compound angles
[AD-A246531] p 3101 N92-27529
FILM THICKNESS
LDEF microenvironments, observed and predicted
p 3066 N92-27220
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409
FILTERS
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309
FINE STRUCTURE
Acoustic sensing of ocean turbulence
[AD-A246752] p 3136 N92-28108
FINITE DIFFERENCE THEORY
Time-marching methods for secondary flow analysis in curved ducts p 3095 N92-27454
Turbine internal fluid flow analysis and Stokes' hypothesis p 3095 N92-27455
Unsteady Euler calculations in 3D internal aerodynamics p 3098 N92-27470
Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485
Fundamental studies on droplet interactions in dense sprays
[AD-A246918] p 3101 N92-27546
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
A boundary integral formulation for unsteady transonic potential flows p 3038 N92-27942
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957
FINITE ELEMENT METHOD
Finite element analysis of monolithic solid oxide fuel cells
[DE92-010515] p 3123 N92-27392

Framework optimization using stochastic gradient process
[ETN-92-90828] p 3159 N92-27406
Calculation by the finite element method of 3-D turbulent flow in a centrifugal pump p 3097 N92-27465
Finite element solution of viscous compressible flows in gas turbine ducts and diffusers p 3099 N92-27477
Application of finite element method to hypersonic nozzle flow computations p 3099 N92-27479
An analysis of the Stress Wave In Solids (SWIS) finite element code
[AD-A245921] p 3115 N92-27573
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
Finite element methods for flow problems
p 3102 N92-27672
Finite element methods for fluids
p 3102 N92-27673
Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674
Multidimensional upwind methods for unstructured grids p 3102 N92-27675
Unstructured grid methods for compressible flows
p 3103 N92-27676
Finite element methods in CFD: Grid generation, adaptivity, and parallelization p 3103 N92-27679
Identification of dynamic structures with special attention to damping matrix representation
[AD-A248020] p 3116 N92-27865
Engine structures modeling software system: Computer code. User's manual
[NASA-CR-189154] p 3116 N92-27872
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems
[NASA-CR-186516] p 3116 N92-27874
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow
p 3040 N92-27953
Research and development of the p-version of the finite element model
[AD-A248582] p 3158 N92-28060
Numerical treatment of differential and integral equations by the p and h-p versions of the finite element method
[AD-A247202] p 3158 N92-28189

FINITE VOLUME METHOD
Time-marching methods for secondary flow analysis in curved ducts p 3095 N92-27454
Three dimensional solution of internal flows using a cell vertex finite volume method p 3098 N92-27473
Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations
p 3103 N92-27677
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes
p 3103 N92-27678

FIRE CONTROL
Firing assembly for stored energy launcher
[AD-D015240] p 3054 N92-27628

FIXED WINGS
Comparison of Janus and field test aircraft detection ranges for the line-of-sight forward heavy system
[AD-A246047] p 3083 N92-27600
An analysis of fixed wing tactical airlifter characteristics using an intra-theater airlift computer model
[AD-A246908] p 3045 N92-27719

FLAME STABILITY
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352

FLAME TEMPERATURE
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161

FLAMES
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853

FLAPS (CONTROL SURFACES)
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191

FLASH LAMPS
Nuclear-driven flashlamp pumping of the atomic iodine laser
[DE92-010609] p 3107 N92-27393

FLAT PLATES
Explicit solution of difference equation for the wavenumber response of fluid-loaded stiffened plate
[AD-A247922] p 3116 N92-27850

FLEXIBILITY
An analysis of total quality management in Aeronautical Systems Division
[AD-A246661] p 3114 N92-27760

FLEXIBLE BODIES
Dynamics and control of high precision magnetically levitated vibration isolation systems
p 3058 N92-27730
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms
p 3113 N92-27780
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782

FLEXIBLE SPACECRAFT
Development of an active damping system to aid in the attitude control of flexible spacecraft
[AD-A246248] p 3050 N92-27200
Ground vibration tests of a high fidelity truss for verification of on orbit damage location techniques
[NASA-TM-107626] p 3115 N92-27375
On the stability of a dual spin satellite with asymmetric rotor and flexible platform
[ISBN-0-315-54650-6] p 3056 N92-27613

FLEXIBLE WINGS
Investigation of the aeroelastic stability of the AFW wind-tunnel model using CAP-TSD p 3040 N92-27955

FLIGHT CHARACTERISTICS
Automated screening of propulsion system test data by neural networks, phase 1
[NASA-CR-184329] p 3066 N92-27403
Flight testing of a half-scale remotely piloted vehicle
[AD-A248568] p 3046 N92-28123

FLIGHT CONTROL
Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility
[NASA-TM-4394] p 3048 N92-27379
Flight-determined benefits of integrated flight-propulsion control systems
[NASA-TM-4393] p 3048 N92-27587
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant
p 3032 N92-27895
Fuzzy guidance system evaluation
p 3034 N92-27903
Parallel knowledge based systems architectures for in-flight mission management p 3034 N92-27904
Robust intelligent flight control for hypersonic vehicles
[NASA-CR-185680] p 3051 N92-28209

FLIGHT CREWS
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518
Area-of-Interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863
A teamwork model of pilot aiding: Psychological principles for mission management systems design
p 3032 N92-27893

FLIGHT ENVELOPES
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870

FLIGHT MANAGEMENT SYSTEMS
On board planning of 4D-trajectories
p 3033 N92-27897
ICAAS piloted simulation evaluation
p 3034 N92-27906

FLIGHT MECHANICS
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870

FLIGHT OPERATIONS
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant
p 3032 N92-27895

FLIGHT PATHS
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
Search route planning p 3033 N92-27900
An efficient method for three-dimensional route planning with different strategies and constraints
p 3033 N92-27901

FLIGHT PLANS
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant
p 3032 N92-27895
Technology and standards for a common air mission planner p 3033 N92-27899

FLIGHT SIMULATION
The modelling of turbulence and downbursts for flight simulators
[ISBN-0-315-59945-6] p 3051 N92-27645
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant
p 3032 N92-27895

FLIGHT SIMULATORS
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836

FLIGHT TESTS
Overview of the systems special investigation --- long duration exposure facility p 3079 N92-27303
Long Duration Exposure Facility (LDEF) low-temperature Heat Pipe Experiment Package (HEPP) flight results
p 3108 N92-27317
Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility
[NASA-TM-4394] p 3048 N92-27379
A meta-analysis of pilot selection tests: Success and performance in pilot training
[AD-A246623] p 3140 N92-27537
From an automated flight-test management system to a flight-test engineer's workstation p 3035 N92-27907
Development of telemetry for the agility flight test of a radio controlled fighter model
[AD-A248653] p 3055 N92-27994
The design, development, and test of balloonborne and groundbased lidar systems. Volume 2: Flight test of Atmospheric Balloon Lidar Experiment, ABLE 2
[AD-A246727] p 3087 N92-28103
Flight testing of a half-scale remotely piloted vehicle
[AD-A248568] p 3046 N92-28123
Evaluation of high lift devices of the quiet STOL experimental aircraft ASKA
[NAL-TR-1102] p 3046 N92-28153
Note on flight measured control effectiveness of the quiet STOL experimental aircraft ASKA
[NAL-TR-1103] p 3051 N92-28154
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191

FLIGHT TIME
Design of fast earth-return trajectories from a lunar base
[AD-A246553] p 3053 N92-27530

FLIGHT TRAINING
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518

FLOW DISTORTION
Self-adaptive aeropropulsion components-enhancing axial compressor performance
[AD-A246123] p 3049 N92-27817

FLOW DISTRIBUTION
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352
Experimental investigation of the unsteady pressure field around an oscillating blade
[MITT-90-01] p 3094 N92-27407
Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades
p 3095 N92-27456
A mathematical constraint placed upon inter-blade row boundary conditions used in the simulation of multistage turbomachinery flows p 3095 N92-27458
On the computation of unsteady turbomachinery flows. Part 1: Euler equations in vibrating cascades
p 3096 N92-27460
Application of CFD in the design of gas turbine engine components p 3049 N92-27461
Computation and visualization of specific flow phenomena in turbomachinery application
p 3050 N92-27463
An integrated CFD system for 3D turbomachinery applications p 3050 N92-27464
Viscous three-dimensional calculations of transonic fan performance p 3097 N92-27467
Navier-Stokes analysis of turbine blade heat transfer and performance p 3097 N92-27468
Steady and unsteady 3D flow computation through a transonic turbine stage p 3050 N92-27469
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle
p 3100 N92-27482
Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483
Fundamental studies on droplet interactions in dense sprays
[AD-A246918] p 3101 N92-27546
Propulsion simulator for magnetically suspended wind tunnel models p 3052 N92-27801

Present status of the MIT/NASA Langley 6-inch MSBS p 3053 N92-27802
A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880
Experimental investigation of turbulence behavior in shock wave/turbulent boundary layer interactions
[AD-A247792] p 3104 N92-27886
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications p 3037 N92-27937
Unstructured-grid methods development for unsteady aerodynamic and aeroelastic analyses p 3038 N92-27938
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation p 3039 N92-27944
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956
Assimilation modeling of coastal transition zone data and continental slope flow fields
[AD-A248692] p 3135 N92-28010

FLOW EQUATIONS
Pressure-based high-order TVD methodology for dynamic stall control
[AD-A247056] p 3105 N92-27918
Unstructured-grid methods development for unsteady aerodynamic and aeroelastic analyses p 3038 N92-27938
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957

FLOW GEOMETRY
Calculation by the finite element method of 3-D turbulent flow in a centrifugal pump p 3097 N92-27465
Three dimensional solution of internal flows using a cell vertex finite volume method p 3098 N92-27473
Presentation of a computational code for 3-D compressible flow in complex channels and cavities p 3098 N92-27475
Validation of non-orthogonal three-dimensional laminar flow predictions p 3098 N92-27476

FLOW MEASUREMENT
An experimental study of hypersonic flow development in a pipe
[UTIAS-TN-275] p 3103 N92-27683
Radial inflow turbine study
[AD-A246938] p 3049 N92-28073

FLOW STABILITY
Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios
[AD-A246057] p 3104 N92-27828

FLOW VISUALIZATION
Computation and visualization of specific flow phenomena in turbomachinery application p 3050 N92-27463
An integrated CFD system for 3D turbomachinery applications p 3050 N92-27464
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671

FLUCTUATION THEORY
Fluctuations for galaxy formation from inflation models
[ISBN-0-315-54662-X] p 3191 N92-27690

FLUENCE
LDEF polymeric materials: 10 months versus 5.8 years of exposure p 3079 N92-27282
Spacecraft thermal control coatings: Comparison between flight results obtained on LDEF and MIR p 3079 N92-27300

FLUID DYNAMICS
A mathematical constraint placed upon inter-blade row boundary conditions used in the simulation of multistage turbomachinery flows p 3095 N92-27458
Coastally trapped disturbances in the lower atmosphere
[ISBN-0-315-55186-0] p 3129 N92-27622
An experimental study of hypersonic flow development in a pipe
[UTIAS-TN-275] p 3103 N92-27683
Special Course on Skin Friction Drag Reduction
[AGARD-R-786] p 3036 N92-27706
Aeronautical engineering: A continuing bibliography with indexes (supplement 277)
[NASA-SP-7037(277)] p 3035 N92-27929
Steady and transient analysis of flows exhibiting strong viscous/inviscid interaction (Composite RNS procedures)
[AD-A247171] p 3105 N92-28175

FLUID FLOW
Turbine internal fluid flow analysis and Stokes' hypothesis p 3095 N92-27455
Computation and visualization of specific flow phenomena in turbomachinery application p 3050 N92-27463
Some basic research problems related to energy
[DE92-011220] p 3072 N92-28043

FLUID MECHANICS
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle
[NASA-CR-188055] p 3052 N92-27976

FLUID PRESSURE
Firing assembly for stored energy launcher
[AD-D015240] p 3054 N92-27628

FLUORESCENCE
Flouorescence measurements of the thermal control coatings on LDEF experiments S0069 and A0114 p 3078 N92-27278
Physics and diagnostics of laser ablation plume propagation for high-(Tc) superconductor film growth
[DE92-009386] p 3171 N92-27362
Simple-reversible fiber-optic chemical sensors using solvatochromic dyes
[DE92-010441] p 3166 N92-27365
Nuclear-driven flashlamp pumping of the atomic iodine laser
[DE92-010609] p 3107 N92-27393
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835

FLUTTER
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
A time-linearization approach for unsteady transonic flows p 3038 N92-27941
Aeroelastic calculations for fighter aircraft using the transonic small disturbance equation p 3040 N92-27951
Computation of flutter boundaries in the time and frequency domain p 3040 N92-27952
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow p 3040 N92-27953
Direct coupling of fluid structure in transonic aeroelasticity p 3040 N92-27954
Investigation of the aeroelastic stability of the AFW wind-tunnel model using CAP-TSD p 3040 N92-27955
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956
The benchmark aeroelastic models program: Description and highlights of initial results p 3041 N92-27960
A gust generation method for full configuration aircraft tests in a low speed wind tunnel. Part 1: Design and preliminary experiments
[NAL-TR-1115-PT-1] p 3043 N92-28192

FLUTTER ANALYSIS
A time-linearization approach for unsteady transonic flows p 3038 N92-27941
Transonic aeroelastic calculations in both the time and frequency domains p 3040 N92-27950
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow p 3040 N92-27953
Investigation of the aeroelastic stability of the AFW wind-tunnel model using CAP-TSD p 3040 N92-27955

FLUX (RATE)
Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004

FLUX PINNING
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Effects of high energy electron irradiation on a yttrium barium(2) copper(3) oxygen(7-delta) high temperature superconductor
[AD-A246895] p 3177 N92-27983

FLUX VECTOR SPLITTING
Multidimensional upwind methods for unstructured grids p 3102 N92-27675

FLYWHEELS
Development of a differentially balanced magnetic bearing and control system for use with a flywheel energy storage system p 3062 N92-27798

FORCE DISTRIBUTION
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream p 3039 N92-27946
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190

FORECASTING
Comparison of Gulf Stream forecast model initialization and verification analyses
[AD-A246218] p 3134 N92-27604

FORESTS
Progress towards SAR based ecosystem analysis p 3119 N92-28014
The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery p 3119 N92-28015
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan p 3119 N92-28017

FORMALISM
The neutron-deuteron in hyperspherical formalism
[BONN-IR-91-13] p 3163 N92-27421

FORWARD SCATTERING
Laboratory measurements of the transmission and scattering of laser beams in optically dense clouds
[ISBN-0-315-58085-2] p 3108 N92-27647

FOUR-WAVE MIXING
Fluctuations and squeezing in resonance fluorescence emitted near a phase conjugator
[AD-A248735] p 3170 N92-28125

FOURIER TRANSFORMATION
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry
[AD-A248410] p 3072 N92-28009
Kinetics of surface reactions studied by laser desorption with FTMS detection
[AD-A248412] p 3109 N92-28051
Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region
[AD-A248612] p 3072 N92-28064

FRACTALS
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352
Fractal image encoding
[AD-A248003] p 3161 N92-27854

FRACTURE MECHANICS
Finite element analysis of monolithic solid oxide fuel cells
[DE92-010515] p 3123 N92-27392
Cracks on or near an interface p 3116 N92-27643
Development of the microstructure based stochastic life prediction models
[AD-A246447] p 3074 N92-27821

FRACTURE STRENGTH
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139
Correlation between fracture toughness, Charpy V-notch impact energy, and yield strength for ASTM A723 steel
[AD-A249142] p 3075 N92-28143

FRANCK-CONDON PRINCIPLE
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835

FREE ELECTRON LASERS
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A246399] p 3162 N92-27751
Development and utilization of the University of California, Santa Barbara, free-electron laser
[AD-A248733] p 3109 N92-28124
Development and scientific utilization of the University of California, Santa Barbara free-electron laser
[AD-A246803] p 3109 N92-28131

FREE FALL
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747

FREE FLOW
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream p 3039 N92-27946

FREE RADICALS
An ESR study of the UV degradation of FEP p 3079 N92-27287

FREQUENCIES
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520
ALE frequency selection for Navy modems: Analysis
[AD-A247569] p 3083 N92-27564

JTIDS electromagnetic compatibility in the 960-1215 MHz band
[AD-A247834] p 3085 N92-27864
FREQUENCY CONTROL
JTIDS electromagnetic compatibility in the 960-1215 MHz band
[AD-A247834] p 3085 N92-27864
FREQUENCY DISCRIMINATORS
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers
[AD-A247574] p 3108 N92-27566
FREQUENCY DISTRIBUTION
HippoDraw and Hippoplotamus
[DE92-010744] p 3146 N92-27414
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655
JTIDS electromagnetic compatibility in the 960-1215 MHz band
[AD-A247834] p 3085 N92-27864
FREQUENCY DIVISION MULTIPLE ACCESS
Coherent communications --- fiber optics applications p 3086 N92-28086
FREQUENCY HOPPING
Performance of a fast frequency-hopped noncoherent MFSK receiver with ratio-statistic combining over Rician fading channels with partial-band interference
[AD-A247034] p 3082 N92-27339
FREQUENCY MODULATION
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers
[AD-A247574] p 3108 N92-27566
Subcarrier-multiplexed coherent optical video transmission using direct frequency modulation of semiconductor lasers
[AD-A247618] p 3167 N92-27597
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784
FREQUENCY RESPONSE
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies
[NASA-TM-105416] p 3111 N92-27879
FREQUENCY SHIFT KEYING
Performance of a fast frequency-hopped noncoherent MFSK receiver with ratio-statistic combining over Rician fading channels with partial-band interference
[AD-A247034] p 3082 N92-27339
Minimum polarization modulation: A highly bandwidth efficient coherent optical modulation scheme
[AD-A247556] p 3167 N92-27596
FREQUENCY STABILITY
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181
FRICTION
Explosives simulants
[DE92-011074] p 3080 N92-27418
Model A: High-temperature tribometer
[AD-A249258] p 3107 N92-28217
FRICTION FACTOR
Turbulence structure and polymer drag reduction in adverse pressure gradient boundary layers
[AD-A246651] p 3104 N92-27757
Fabric-stress-deformation relations in granular materials
[AD-A247009] p 3117 N92-28138
FRICTION REDUCTION
Special Course on Skin Friction Drag Reduction
[AGARD-R-786] p 3036 N92-27706
Basic concepts on boundary layers p 3036 N92-27707
FROZEN EQUILIBRIUM FLOW
Application of finite element method to hypersonic nozzle flow computations p 3099 N92-27479
FUEL CELLS
Finite element analysis of monolithic solid oxide fuel cells
[DE92-010515] p 3123 N92-27392
FUEL COMBUSTION
The structure and reactivity of boron surfaces
[AD-A247265] p 3071 N92-27510
FUEL CONSUMPTION
Performance analysis of non-coplanar synergetic maneuvers
[AD-A246576] p 3054 N92-27534
Flight-determined benefits of integrated flight-propulsion control systems
[NASA-TM-4393] p 3048 N92-27587
Drag reduction: An industrial challenge p 3036 N92-27708
FUEL INJECTION
The relationship between fuel lubricity and diesel injection system wear
[AD-A247927] p 3110 N92-27851
FUEL PUMPS
An experimental study of a small high speed LH2 rocket pump: A suppression method of asynchronous shaft vibrations
[NAL-TR-1118] p 3110 N92-27431
FUEL TESTS
The structure and reactivity of boron surfaces
[AD-A247265] p 3071 N92-27510
FUELS
High energy explosive yield enhancer using microencapsulation
[AD-D015195] p 3080 N92-27492
FULLERENES
Observation of fullerenes (C60-C70) associated with LDEF crater number 31 p 3073 N92-27262
FUNCTIONAL DESIGN SPECIFICATIONS
System requirements specification for SMART structures mode p 3149 N92-27830
FUSELAGES
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages p 3149 N92-27831
FUSION REACTORS
Analytical formula for ignition access condition in a magnetic fusion reactor
[PPL-114] p 3173 N92-27882
Operation path method for ignition criterion in a D-T tokamak reactor
[PPL-122] p 3174 N92-28193
Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194
FUZZY SETS
Determining rules for closing customer service centers: A public utility company's fuzzy decision
[NASA-CR-190390] p 3181 N92-27572
Measuring uncertainty by extracting fuzzy rules using rough sets and extracting fuzzy rules under uncertainty and measuring definability using rough sets
[NASA-CR-190394] p 3148 N92-27585
FUZZY SYSTEMS
Fuzzy guidance system evaluation p 3034 N92-27903

G

GADOLINIUM
Application of the renormalization group to critical phenomena in magnetic systems
[ISBN-0-315-56216-1] p 3161 N92-27638
GALACTIC CLUSTERS
Clustering of faint galaxies
[ISBN-0-315-53743-4] p 3189 N92-27686
Gravitational clustering of galaxies: Distribution of galaxy counts in cells
[ISBN-0-315-59910-3] p 3190 N92-27687
Development of voids in the thin-wall approximation
[ISBN-0-315-60772-6] p 3191 N92-27689
Turbulent cooling flows in galaxies and clusters
[ISBN-0-315-61634-2] p 3191 N92-27699
GALACTIC COSMIC RAYS
Three-dimensional shielding effects on charged particle fluences measured in the P0006 experiment in LDEF p 3165 N92-27235
Heavy Ions In Space (HIIS) experiment p 3165 N92-27240
GALACTIC EVOLUTION
Clustering of faint galaxies
[ISBN-0-315-53743-4] p 3189 N92-27686
Development of voids in the thin-wall approximation
[ISBN-0-315-60772-6] p 3191 N92-27689
Fluctuations for galaxy formation from inflation models
[ISBN-0-315-54662-X] p 3191 N92-27690
GALACTIC MASS
Topics in galactic dynamics
[ISBN-0-315-47774-1] p 3190 N92-27611
GALACTIC ROTATION
Topics in galactic dynamics
[ISBN-0-315-47774-1] p 3190 N92-27611
GALACTIC STRUCTURE
Identification and study of HII regions in the IRAS point source catalog
[ISBN-0-315-61537-0] p 3189 N92-27700
GALAXIES
Clustering of faint galaxies
[ISBN-0-315-53743-4] p 3189 N92-27686
GALERKIN METHOD
Finite element methods for flow problems p 3102 N92-27672
Finite element methods for fluids p 3102 N92-27673
Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674
GALLIUM ARSENIDES
Solid state research
[AD-A247338] p 3176 N92-27216
Development of a Ge/GaAs HMT technology based on plasma enhanced chemical vapor deposition
[AD-A246991] p 3176 N92-27381
Passivation and gating of GaAs and Si surfaces using pseudomorphic structures
[AD-A246990] p 3176 N92-27402
Characterization of semi-insulating gallium arsenide
[AD-A246511] p 3177 N92-27632
GALLIUM COMPOUNDS
Spectral properties of a novel laser crystal Y3(In, Ga)2Ga3O12:Cr3(+)
[AD-A246254] p 3175 N92-27201
GAMMA RAY ASTRONOMY
Gamma astronomy satellite p 3053 N92-27932
GAMMA RAY BURSTS
Analysis of the possibilities of suppression of the cosmic-ray background when detecting very high energy cosmic gamma quanta by means of a system of Cherenkov gamma telescopes with multichannel light receivers
[DE92-620916] p 3195 N92-27493
GAMMA RAY LASERS
Proof of the feasibility of coherent and incoherent schemes for pumping a gamma ray laser
[AD-A245372] p 3107 N92-27438
GAMMA RAY SPECTRA
A photon-phreak digs the LDEF happening p 3164 N92-27226
Collection, analysis, and archival of LDEF activation data p 3188 N92-27227
GAMMA RAY SPECTROMETERS
Sensitivity of LDEF foil analyses using ultra-low background germanium versus large NaI(T1) multidimensional spectrometers p 3196 N92-27224
GAMMA RAY TELESCOPES
Analysis of the possibilities of suppression of the cosmic-ray background when detecting very high energy cosmic gamma quanta by means of a system of Cherenkov gamma telescopes with multichannel light receivers
[DE92-620916] p 3195 N92-27493
JPRS report: Science and technology. Central Eurasia: Space
[JPRS-USP-92-001] p 3053 N92-27931
Gamma astronomy satellite p 3053 N92-27932
GAMMA RAYS
Radioactivities induced in some LDEF samples p 3164 N92-27225
Criticality of Be-7 concentration in LDEF p 3165 N92-27238
Proof of the feasibility of coherent and incoherent schemes for pumping a gamma ray laser
[AD-A245372] p 3107 N92-27438
GAS ATOMIZATION
Environmentally stable metal powders — gas atomization process
[AD-D015222] p 3074 N92-27619
GAS COMPOSITION
Inspired gas composition influences recovery from experimental venous air embolism
[AD-A247004] p 3138 N92-28135
GAS DENSITY
Oxygen isotopes implanted in the LDEF spacecraft p 3165 N92-27284
GAS DYNAMICS
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488
GAS GENERATORS
Burst diaphragm sequence valve
[AD-D015241] p 3110 N92-27629
GAS MIXTURES
Inspired gas composition influences recovery from experimental venous air embolism
[AD-A247004] p 3138 N92-28135
GAS PRESSURE
Investigation of a heat driven thermoacoustic prime mover above onset of self-oscillation
[AD-A246257] p 3162 N92-27202
Investigation of an argon-filled thermoacoustic prime mover
[AD-A246751] p 3179 N92-28107
GAS TEMPERATURE
Tritium measurement technique using in-bed calorimetry
[DE92-010061] p 3079 N92-27363
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers
[AD-A246037] p 3108 N92-27657
GAS TURBINE ENGINES
Heavy duty transport research needs assessment
[DE92-010622] p 3109 N92-27394

Application of CFD in the design of gas turbine engine components p 3049 N92-27461
Experimental study of cross-stream mixing in a rectangular duct
[NASA-TM-105694] p 3049 N92-27652
Feasibility of magnetic bearings for advanced gas turbine engines p 3059 N92-27738

GAS TURBINES
A computational study of tip leakage flow and losses in a linear turbine cascade p 3095 N92-27453
Turbine internal fluid flow analysis and Stokes' hypothesis p 3095 N92-27455
Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades p 3095 N92-27456
Finite element solution of viscous compressible flows in gas turbine ducts and diffusers p 3099 N92-27477
Aerothermodynamics of nozzle flows for advanced hypersonic propulsion systems p 3099 N92-27478
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber p 3050 N92-27484
Radial inflow turbine study
[AD-A246938] p 3049 N92-28073

GASDYNAMIC LASERS
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers
[AD-A246037] p 3108 N92-27857

GAUGE INVARIANCE
The Cornwall-Norton model in the strong coupling regime
[DE92-621061] p 3164 N92-27498

GAUGE THEORY
Estimation of oblique electroweak corrections
[DE92-010742] p 3179 N92-28160

GEARS
Precise positioning and compliance synthesis for automatic assembly using Lorentz levitation p 3062 N92-27797
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies
[NASA-TM-105416] p 3111 N92-27879

GENETICS
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382

GEOCHRONOLOGY
Interpretation of time domain electromagnetic soundings near geological contacts
[DE92-010467] p 3126 N92-27347
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada p 3121 N92-28027

GEODESY
Evaluation of absolute positioning using the Defense Mapping Agency's (GASP) program
[AD-A246818] p 3044 N92-28133

GEOGRAPHIC INFORMATION SYSTEMS
A conceptual design for the Telecommunications Emergency Decision Support System (TEDSS)
[AD-A246045] p 3083 N92-27660

GEOLOGICAL FAULTS
Determination of shear wave velocity structure in the Rio Grande rift through receiver function and surface wave analysis, appendix B
[AD-A246937] p 3128 N92-28072

GEOLOGICAL SURVEYS
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026

GEOMAGNETISM
Magnetic fields generated by internal ocean seawater motion
[AD-A246589] p 3132 N92-27502
Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594

GEOMETRIC RECTIFICATION (IMAGERY)
Geometric rectification and geocoding of JPL's AIRSAR data over hilly terrain p 3088 N92-28035

GEOMETRICAL THEORY OF DIFFRACTION
Optically stable, large time bandwidth acousto-optic heterodyne spectrum analyzer with fixed non-zero heterodyne output
[AD-D015223] p 3163 N92-27998

GEOMETRY
Form error models of the NIST algorithm testing system
[PB92-172014] p 3150 N92-27923

GEOPHYSICS
Interpretation of time domain electromagnetic soundings near geological contacts
[DE92-010467] p 3126 N92-27347
An 11-CM full-matrix polarimetric radar for meteorological research
[AD-A246893] p 3082 N92-27506
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908
Activities, accomplishments and research progress of the Center for Theoretical Geoplasma Physics, Center for Space Research, Massachusetts Inst. of Technology
[AD-A248572] p 3127 N92-27963

GEOSAT SATELLITES
Comparison of Gulf Stream forecast model initialization and verification analyses
[AD-A246218] p 3134 N92-27604

GEOSTROPHIC WIND
Monthly mean sea ice data from the polar ice prediction system, the regional polar ice prediction system (Barents Sea), and the regional polar ice prediction system (Greenland Sea)
[AD-A246145] p 3134 N92-27574

GEOTECHNICAL ENGINEERING
Geotechnical centrifuge use at University of Cambridge Geotechnical Centre, August-September 1991
[AD-A246490] p 3126 N92-27209
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908

GERMANIUM
Sensitivity of LDEF foil analyses using ultra-low background germanium versus large NaI(T1) multidimensional spectrometers p 3196 N92-27224
Development of a Ge/GaAs HMT technology based on plasma enhanced chemical vapor deposition
[AD-A246991] p 3176 N92-27381

GERMINATION
Final results of the Space Exposed Experiment Developed for Students (SEEDS) P-0004-2 p 3136 N92-27322
Continued results of the seeds in space experiment p 3136 N92-27323

GHOSTS
UHF television reception: Ghost images from very large buildings
[BBC-RD-1992/1] p 3087 N92-28100

GIMBALS
Performance of a superconducting large-angle magnetic suspension p 3065 N92-27815

GLACIAL DRIFT
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada p 3121 N92-28027

GLACIERS
Review of climatic fluctuations on the century timescale
[CGCR-89-7] p 3124 N92-27426
Snow and glacier mapping with polarimetric SAR p 3120 N92-28021

GLASS
Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247
Glass sample preparation and performance investigations --- solar x-ray imager
[NASA-CR-190399] p 3169 N92-27871

GLASS COATINGS
Effects of long term space environment exposure on optical substrates and coatings (S0050-2) p 3170 N92-27310
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967

GLOBAL POSITIONING SYSTEM
NAL Dornier 228-200 flight research airplane: Present status and outline of the installed equipment
[NAL-TM-637] p 3045 N92-27429
Dredging research program: Global positioning system bibliography
[AD-A248954] p 3044 N92-28079
Evaluation of absolute positioning using the Defense Mapping Agency's (GASP) program
[AD-A246818] p 3044 N92-28133

GLOBAL WARMING
Sensitivity of global warming potentials to the assumed background atmosphere
[DE92-011072] p 3124 N92-27417
Monitoring of global acoustic transmissions: Signal processing and preliminary data analysis
[AD-A246572] p 3162 N92-27532

GLOVES
Development of a standard anthropometric dimension set for use in computer-aided glove design
[AD-A246272] p 3143 N92-27664

GLYCEROLS
Particle image velocimetry
[AD-A246638] p 3052 N92-27753

GOLD
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122

GOODNESS OF FIT
An exploratory application of neural networks to the sortie generation forecasting problem
[AD-A246626] p 3157 N92-27980

GRADIENTS
Framework optimization using stochastic gradient process
[ETN-92-90828] p 3159 N92-27406
A Cramer-Rao type lower bound for essentially unbiased parameter estimation
[AD-A246666] p 3160 N92-27915
Gradient estimation for ratios
[AD-A248453] p 3160 N92-28140

GRAIN BOUNDARIES
Processing, microstructure and superplasticity in Al-Mg-Mn alloys
[AD-A246488] p 3073 N92-27207
Nanophase materials assembled from clusters
[DE92-010508] p 3076 N92-27412
Research in high dielectric properties of ferroelectric materials
[AD-A246899] p 3177 N92-27985

GRAIN SIZE
Nanophase materials assembled from clusters
[DE92-010508] p 3076 N92-27412

GRAMMARS
Implementation of parallel algorithms
[AD-A248759] p 3150 N92-27995

GRAND UNIFIED THEORY
Fluctuations for galaxy formation from inflation models
[ISBN-0-315-54662-X] p 3191 N92-27690

GRANULAR MATERIALS
Fabric-stress-deformation relations in granular materials
[AD-A247009] p 3117 N92-28138

GRAPH THEORY
Tactical communications network modelling and reliability analysis: An overview
[AD-A245339] p 3084 N92-27855

GRAPHIC ARTS
NPSNET: Physically-based modeling enhancements to an object file format
[AD-A246594] p 3146 N92-27504
Computer graphics for bearing dynamic analysis
[AD-A247567] p 3148 N92-27584
A sophisticated cad tool for the creation of complex models for electromagnetic interaction analysis
[AD-A245936] p 3085 N92-27858
Advanced user interface capabilities for application on portable computers
[AD-A247295] p 3144 N92-28177

GRAPHITE
Residual thermal stresses in graphite/PEEK (APC-2) laminates
[AD-A247450] p 3077 N92-27592

GRAPHITE-EPOXY COMPOSITES
LDEF thermal control coatings post-flight analysis p 3078 N92-27276
High-toughness graphite/epoxy composite material experiment p 3070 N92-27289
Space environmental effects on LDEF composites: Leading graphite/epoxy panel, selected trailing edge specimens p 3070 N92-27290
A preliminary study on damage detection using piezoelectric film
[AD-A246350] p 3046 N92-28118

GRAPHS (CHARTS)
A formal definition of the object-oriented paradigm for requirements analysis
[AD-A246814] p 3044 N92-28132

GRASSES
Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543

GRASSLANDS
Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543

GRATINGS (SPECTRA)
Ruled and holographic experiment (AO 138-5) --- long duration exposure facility p 3107 N92-27312
Integrated optical pipelined polynomial processors
[AD-A248573] p 3092 N92-27992

GRAVITATION
Solutions of Einstein's equations having functionally separable metrics
[ISBN-0-315-60751-3] p 3179 N92-27688

GRAVITATION THEORY
Solutions of Einstein's equations having functionally separable metrics
[ISBN-0-315-60751-3] p 3179 N92-27688

GRAVITATIONAL PHYSIOLOGY
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371
Metabolic energy requirements for space flight
[NASA-TM-107933] p 3138 N92-28212
GRAVITATIONAL WAVES
Autogravity waves in a polytropic layer
p 3195 N92-27635
GRAVITY WAVES
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434
The observable effects of gravity waves on airglow emissions
[ISBN-0-315-57927-7] p 3127 N92-27620
Acoustic sensing of ocean turbulence
[AD-A246752] p 3136 N92-28108
GREENHOUSE EFFECT
The oceans' role in climate variability and climate change
[CGCR-89-9] p 3124 N92-27359
Sensitivity of global warming potentials to the assumed background atmosphere
[DE92-011072] p 3124 N92-27417
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
Monitoring of global acoustic transmissions: Signal processing and preliminary data analysis
[AD-A246572] p 3162 N92-27532
GREENLAND
Acoustic tomography in the Greenland Sea
[AD-A246574] p 3133 N92-27533
GRID GENERATION (MATHEMATICS)
An integrated CFD system for 3D turbomachinery applications p 3050 N92-27464
Validation of non-orthogonal three-dimensional laminar flow predictions p 3098 N92-27476
Unstructured grid methods for compressible flows
p 3103 N92-27676
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations
p 3103 N92-27677
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes
p 3103 N92-27678
Finite element methods in CFD: Grid generation, adaptivity, and parallelization p 3103 N92-27679
A frontal approach for node generation in Delaunay triangulations p 3103 N92-27680
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation
p 3039 N92-27944
GRIDS
Datums, ellipsoids, grids, and grid reference systems
[AD-A247651] p 3118 N92-27554
GROOVES
Fatigue life improvement of an autofrettage thick-walled pressure vessel with an external groove
[AD-A247233] p 3115 N92-27213
GROUND BASED CONTROL
Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292
GROUND CREWS
Human factors evaluation of the work environment of operators engaged in the inspection and repair of aging aircraft
[AD-A246445] p 3043 N92-27914
GROUND EFFECT MACHINES
Pitch-heave dynamics models for an air cushion vehicle
[ISBN-0-315-51095-1] p 3036 N92-27624
GROUND STATE
Spectroscopy, reaction, and photodissociation in highly vibrationally excited molecules
[DE92-010651] p 3163 N92-27396
GROUND TESTS
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288
Ground vibration tests of a high fidelity truss for verification of on orbit damage location techniques
[NASA-TM-107626] p 3115 N92-27375
GROUP DYNAMICS
A teamwork model of pilot aiding: Psychological principles for mission management systems design
p 3032 N92-27893
GUIDANCE (MOTION)
The concept of the mechanically active guideway as a novel approach to maglev p 3064 N92-27807
Optimal guidance anticipating missile performance
p 3034 N92-27902
Radiation, scattering, and guidance of electromagnetic fields by arbitrarily shaped structures embedded in layered dielectric media
[AD-A248951] p 3085 N92-28066
GUIDANCE SENSORS
Development of a machine vision guidance system for automated assembly of space structures
p 3156 N92-27775
GUIDE VANES
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row
p 3050 N92-27466
GULF STREAM
Comparison of Gulf Stream forecast model initialization and verification analyses
[AD-A246218] p 3134 N92-27604
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023
GUMS (SUBSTANCES)
Synthesis and characterization of new poly(alkyl/aryliphosphazenes)
[AD-A245380] p 3076 N92-27442
GUN LAUNCHERS
Firing assembly for stored energy launcher
[AD-D015240] p 3054 N92-27628
GUN PROPELLANTS
Erosion in a 20-mm-gun produced by normal and LOVA propellant charges
[ISL-CO-215/89] p 3080 N92-27927
GUNFIRE
Firing assembly for stored energy launcher
[AD-D015240] p 3054 N92-27628
GUNS (ORDNANCE)
Firing assembly for stored energy launcher
[AD-D015240] p 3054 N92-27628
GUSTS
A pressure measurement method using Electronically Scanner Pressure sensors (ESP) installed in a gust wind tunnel
[NAL-TM-638] p 3051 N92-27428
A gust generation method for full configuration aircraft tests in a low speed wind tunnel. Part 1: Design and preliminary experiments
[NAL-TR-1115-PT-1] p 3043 N92-28192
GYRODAMPERS
Optimal control of large space structures using distributed gyricity: A continuum approach
[ISBN-0-315-56953-0] p 3056 N92-27612
GYROSCOPES
An electrostatically suspended, micro-mechanical rate gyroscope p 3064 N92-27810

H

H LINES
A study of the diffuse interstellar medium through neutral hydrogen absorption observations toward pulsars
[ISBN-0-315-54703-0] p 3189 N92-27644
HALOS
Simulation of tail distributions in electron-positron circular colliders
[DE92-010743] p 3166 N92-27413
HAMILTONIAN FUNCTIONS
Perturbation theory in light-cone quantization
[DE92-011076] p 3167 N92-27419
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
HANDBOOKS
LDEF space optics handbook --- long duration exposure facility p 3171 N92-27311
The metrics handbook
[AD-A248591] p 3081 N92-28180
HARDENING (MATERIALS)
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178
HARDENING (SYSTEMS)
The electromagnetic pulse environment and its influence on tactical electronic and communications equipment
[AD-A246754] p 3087 N92-28129
HARDWARE
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784
HARMONIC EXCITATION
Computation of flutter boundaries in the time and frequency domain p 3040 N92-27952
HARMONIC GENERATIONS
Large second-harmonic response of C60 thin films
[AD-A248957] p 3092 N92-28080
HARMONIC GENERATORS
Investigation of polyisocyanates as second harmonic generating materials
[DE92-010445] p 3089 N92-27366
HARMONIC OSCILLATION
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation
p 3039 N92-27944
HARMONIC OSCILLATORS
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
HARMONICS
Comparison of Euler and full potential methods for unsteady transonic flow calculations
p 3038 N92-27943
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation
p 3039 N92-27944
HAZARDS
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990
HEAD MOVEMENT
Reference frames in vision
[AD-A248743] p 3138 N92-27968
HEALTH
Project MEDSAT: The design of a remote sensing platform for malaria research and control
[NASA-CR-190008] p 3055 N92-27541
HEAO 3
New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876
HEARING
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916
Narrowband and broadband envelope cues for aural classification
[AD-A248693] p 3163 N92-28011
HEAT BUDGET
Seasonal, monthly, and annual reports of ocean weather stations: Anomaly time series of surface heat budget parameters
[CGCR-91-3] p 3131 N92-27341
HEAT EXCHANGERS
Investigation of a heat driven thermoacoustic prime mover above onset of self-oscillation
[AD-A246257] p 3162 N92-27202
Solid-vapor adsorption refrigeration system development
[PB92-164383] p 3081 N92-27715
HEAT FLUX
A generalized approach to the thermal analysis of the Long Duration Exposure Facility's flight experiments
p 3179 N92-27221
Structural materials for high-heat flux applications
[DE92-010253] p 3073 N92-27346
Turbulent heat flux measurements in a transitional boundary layer
[NASA-TM-105623] p 3035 N92-27377
HEAT GENERATION
A simplified nonlinear model for a Combined Heat and Power (CHP) system
[RR-416] p 3081 N92-27926
HEAT MEASUREMENT
Tritium measurement technique using in-bed calorimetry
[DE92-010061] p 3079 N92-27363
Explosives simulants
[DE92-011074] p 3080 N92-27418
HEAT OF COMBUSTION
Erosion in a 20-mm-gun produced by normal and LOVA propellant charges
[ISL-CO-215/89] p 3080 N92-27927
HEAT PIPES
Long Duration Exposure Facility (LDEF) low-temperature Heat Pipe Experiment Package (HEPP) flight results
p 3106 N92-27317
HEAT TRANSFER
Turbine internal fluid flow analysis and Stokes' hypothesis p 3095 N92-27455
Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades
p 3095 N92-27456
Navier-Stokes analysis of turbine blade heat transfer and performance p 3097 N92-27468
Numerical representation of heat transfer into turbine blade cooling ducts p 3098 N92-27474
Heat transfer, adiabatic effectiveness and injectant distributions downstream of single and double rows of film-cooling holes with compound angles
[AD-A246531] p 3101 N92-27529

Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318
[DE92-009408] p 3117 N92-28041
Enhancement of boiling heat transfer in di-electric fluids
[AD-A245962] p 3105 N92-28058
Thermal resistance values of some protective clothing ensembles
[AD-A245937] p 3144 N92-28166

HEAT TRANSMISSION
The use of electrical transmission line theory to predict the performance of spacecraft radiators
[AD-A247786] p 3091 N92-27861

HEAVING
Pitch-heave dynamics models for an air cushion vehicle
[ISBN-0-315-51095-1] p 3036 N92-27624

HEAVY IONS
Light-heavy ion measurements in CR-39 located on the Earth side of LDEF p 3165 N92-27234
Heavy Ions In Space (HIIS) experiment p 3165 N92-27240

HEAVY NUCLEI
Ultra heavy cosmic ray experiment (A0178) p 3196 N92-27241
New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876

HELICOPTER DESIGN
Human-powered helicopter: A program for design and construction
[AD-A246821] p 3142 N92-27350

HELICOPTER PERFORMANCE
Human-powered helicopter: A program for design and construction
[AD-A246821] p 3142 N92-27350

HELICOPTERS
Comparison of Janus and field test aircraft detection ranges for the line-of-sight forward heavy system
[AD-A246047] p 3083 N92-27600
Steady-state acoustical noise measurements in aviation systems
[AD-A247831] p 3162 N92-27924
Composite profiles of helicopter mishaps at heliports and airports
[AD-A248887] p 3043 N92-28052

HELIOS SATELLITES
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809

HELIOSEISMOLOGY
Future missions studies: Combining Schatten's solar activity prediction model with a chaotic prediction model
[NASA-CR-189865] p 3194 N92-28221

HELIPORTS
Composite profiles of helicopter mishaps at heliports and airports
[AD-A248887] p 3043 N92-28052

HELIUM
Investigation of a heat driven thermoacoustic prime mover above onset of self-oscillation
[AD-A246257] p 3162 N92-27202

HELIUM ISOTOPES
Tritium measurement technique using in-bed calorimetry
[DE92-010061] p 3079 N92-27363

HELIUM-NEON LASERS
Particle image velocimetry
[AD-A246638] p 3052 N92-27753

HELMETS
Sound attenuation characteristics of the DH-133A helmet
[AD-A248351] p 3143 N92-27991

HEMODYNAMIC RESPONSES
Inspired gas composition influences recovery from experimental venous air embolism
[AD-A247004] p 3138 N92-28135

HERMETIC SEALS
Burst diaphragm sequence valve
[AD-D015241] p 3110 N92-27629

HETERODYNING
Optically stable, large time bandwidth acousto-optic heterodyne spectrum analyzer with fixed non-zero heterodyne output
[AD-D015223] p 3163 N92-27998
All-optical fiber Faraday rotation current sensor with heterodyne detection technique
[AD-D015226] p 3170 N92-28001

HEURISTIC METHODS
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
Search route planning p 3033 N92-27900
An efficient heuristic scheduler for hard real-time systems
[AD-A247322] p 3152 N92-28169

HIERARCHIES
Natural language processing of captions for retrieving multimedia data
[AD-A247780] p 3184 N92-27860
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163

HIGH ELECTRON MOBILITY TRANSISTORS
Numerical simulation of the function of scientific instrumentation for measuring the speed of electron devices
[AD-A247006] p 3093 N92-28137

HIGH ENERGY ELECTRONS
Effects of high energy electron irradiation on a yttrium barium(2) copper(3) oxygen(7-delta) high temperature superconductor
[AD-A246895] p 3177 N92-27983

HIGH ENERGY INTERACTIONS
HippoDraw and Hippoplotamus
[DE92-010744] p 3146 N92-27414
Perturbation theory in light-cone quantization
[DE92-011076] p 3167 N92-27419
Bose-Einstein correlations in proton-antiproton collisions at square root of s equals 200 to 900 GeV
[ISBN-0-315-50129-4] p 3164 N92-27691
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045

HIGH FIELD MAGNETS
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields p 3060 N92-27746

HIGH GRAVITY ENVIRONMENTS
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 3
[CTN-92-60539] p 3143 N92-27358

HIGH PASS FILTERS
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656

HIGH POWER LASERS
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers
[AD-A246037] p 3108 N92-27657

HIGH PRESSURE
Investigation of the rate-controlling mechanism(s) for high temperature creep and the relationship between creep and melting by use of high pressure as a variable
[DE92-011058] p 3074 N92-27416

HIGH RESOLUTION
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes p 3103 N92-27678

HIGH SPEED
Professor Jesse W. Beams and the first practical magnetic suspension p 3057 N92-27723
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
High speed local area networks p 3086 N92-28087

HIGH STRENGTH STEELS
Shielded metal arc welding consumables for advanced high strength steels
[AD-A247005] p 3075 N92-28136
Correlation between fracture toughness, Charpy V-notch impact energy, and yield strength for ASTM A723 steel
[AD-A249142] p 3075 N92-28143

HIGH TEMPERATURE
Investigation of the rate-controlling mechanism(s) for high temperature creep and the relationship between creep and melting by use of high pressure as a variable
[DE92-011058] p 3074 N92-27416
High temperature silicide protective coating slurry
[AD-D015194] p 3076 N92-27491
Model A: High-temperature tribometer
[AD-A249258] p 3107 N92-28217

HIGH TEMPERATURE GASES
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640

HIGH TEMPERATURE SUPERCONDUCTORS
Application of the renormalization group to critical phenomena in magnetic systems
[ISBN-0-315-56216-1] p 3161 N92-27638
Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734
Levitation of YBa2Cu3O(7-x) superconductor in a variable magnetic field p 3059 N92-27735
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Characterization of superconducting magnetic bearings (dynamic stiffness and damping coefficient in axial direction) p 3059 N92-27737
Magnetic suspension using high temperature superconducting cores p 3061 N92-27789
Effect of flux penetration on the load capacity of passive superconducting bearings p 3061 N92-27790
Application of ceramic superconductors in high speed turbines p 3061 N92-27791
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869
Effects of high energy electron irradiation on a yttrium barium(2) copper(3) oxygen(7-delta) high temperature superconductor
[AD-A246895] p 3177 N92-27983
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012
Monolithic integration of semiconductor and superconductor components
[AD-A248952] p 3092 N92-28067
Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials
[AD-A248736] p 3078 N92-28126

HIGH TEMPERATURE TESTS
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C
[AD-A246407] p 3069 N92-27752

HILBERT TRANSFORMATION
Design of digital signal processing algorithms for enhancing the measurements of ultra-fast electromagnetic transients
[AD-A246269] p 3148 N92-27663

HISTOGRAMS
HippoDraw and Hippoplotamus
[DE92-010744] p 3146 N92-27414

HODOSCOPES
Analysis of the possibilities of suppression of the cosmic-ray background when detecting very high energy cosmic gamma quanta by means of a system of Cherenkov gamma telescopes with multichannel light receivers
[DE92-620916] p 3195 N92-27493

HOLE BURNING
Four-dimensional interconnect experimental development
[AD-A247287] p 3106 N92-27385
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27716

HOLE DISTRIBUTION (MECHANICS)
Heat transfer, adiabatic effectiveness and injectant distributions downstream of single and double rows of film-cooling holes with compound angles
[AD-A246531] p 3101 N92-27529

HOLE GEOMETRY (MECHANICS)
Heat transfer, adiabatic effectiveness and injectant distributions downstream of single and double rows of film-cooling holes with compound angles
[AD-A246531] p 3101 N92-27529

HOLE MOBILITY
Passivation and gating of GaAs and Si surfaces using pseudomorphic structures
[AD-A246990] p 3176 N92-27402

HOLMIUM
Holmium laser pumped with a neodymium laser
[AD-D015220] p 3108 N92-27617

HOLOGRAMMETRY
Four-dimensional interconnect experimental development
[AD-A247287] p 3106 N92-27385

HOLOGRAPHY
Ruled and holographic experiment (AO 138-5) --- long duration exposure facility p 3107 N92-27312
Holographic data storage crystals for the LDEF --- long duration exposure facility p 3178 N92-27313

HOMOLOGY
Deformations of complex structures on gamma/SL2(C) and cohomology of local systems p 3161 N92-27556

HOMOMORPHISMS
A simple example of modeling hybrid systems using bialgebras: Preliminary version
[NASA-CR-190331] p 3157 N92-27557

HONEYCOMB CORES
Determination of minimum adherend thickness for climbing drum and floating roller adhesive tests
[AD-A248883] p 3111 N92-27996

HORIZON
Infrared horizon detection
[AD-A246904] p 3084 N92-27717

HOT ISOSTATIC PRESSING
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819

HUDSON BAY (CANADA)
Climatic atlas of seasonal sea-level pressure and sea-ice concentration in the Hudson Bay-Baffin Bay-Labrador Sea region, 1953-1988
[CGCR-91-5] p 3132 N92-27342
HUMAN BEHAVIOR
Gender, equity, and job satisfaction
[AD-A246588] p 3139 N92-27501
Dual-task performance as a function of presentation mode and individual differences in verbal and spatial ability
[AD-A246611] p 3139 N92-27535
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
HUMAN BEINGS
The carcinogenic risks of low-LET and high-LET ionizing radiations
[DE92-010477] p 3136 N92-27349
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094
HUMAN FACTORS ENGINEERING
Development of a standard anthropometric dimension set for use in computer-aided glove design
[AD-A246272] p 3143 N92-27664
A teamwork model of pilot aiding: Psychological principles for mission management systems design
p 3032 N92-27893
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
Human factors evaluation of the work environment of operators engaged in the inspection and repair of aging aircraft
[AD-A246445] p 3043 N92-27914
Ergonomics manual
[AD-A246934] p 3143 N92-28071
HUMAN PERFORMANCE
Attentional demands and effects of extended practice in a one-finger key-pressing task
[AD-A245384] p 3138 N92-27444
Gender, equity, and job satisfaction
[AD-A246588] p 3139 N92-27501
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518
Dual-task performance as a function of presentation mode and individual differences in verbal and spatial ability
[AD-A246611] p 3139 N92-27535
Human image understanding
[AD-A247048] p 3140 N92-27825
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
Comparability of two cognitive performance assessment systems
[AD-A248760] p 3144 N92-28095
HUMAN RESOURCES
An analysis of total quality management in Aeronautical Systems Division
[AD-A246661] p 3114 N92-27760
HYDRAZINES
Precomplexation and activation of carboxylate and phosphate esters
[AD-A247778] p 3077 N92-27704
The effects of hydrazines on neuronal excitability
[AD-A247103] p 3137 N92-27844
HYDRAZOIC ACID
Spectroscopy and reactions of hydrazoic acid on silicon single crystal surfaces. (2). HN3 and DN3 on Si (100)
[AD-A247047] p 3177 N92-28077
HYDROCARBON FUELS
Finite element analysis of monolithic solid oxide fuel cells
[DE92-010515] p 3123 N92-27392
Autoignition of single droplets of two-component liquid fuels
[CTN-92-60454] p 3071 N92-27634
A model for the autoignition of single liquid droplets at high pressure
[CTN-92-60493] p 3071 N92-27694
HYDROCARBONS
Enhancement of boiling heat transfer in di-electric fluids
[AD-A245962] p 3105 N92-28058
HYDRODYNAMIC EQUATIONS
Destabilized ion acoustic transit mode and anomalous transport in tokamaks
[PPL-123] p 3172 N92-27447
HYDROGEN
Extended H2 synthesis for multiple degree-of-freedom controllers p 3059 N92-27741
HYDROGEN CLOUDS
A study of the diffuse interstellar medium through neutral hydrogen absorption observations toward pulsars
[ISBN-0-315-54703-0] p 3189 N92-27644
HYDROGEN IONS
Hydrogenic ion recombination
[AD-A246886] p 3072 N92-28145
HYDROGEN ISOTOPES
Tritium measurement technique using in-bed calorimetry
[DE92-010061] p 3079 N92-27363
HYDROGRAPHY
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515
HYDROMETEOROLOGY
An 11-CM full-matrix polarimetric radar for meteorological research
[AD-A246893] p 3082 N92-27506
HYDROPHONES
Monitoring of global acoustic transmissions: Signal processing and preliminary data analysis
[AD-A246572] p 3162 N92-27532
HYDROPONICS
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991
[NASA-TM-107546] p 3136 N92-27877
HYDROXYL RADICALS
Precomplexation and activation of carboxylate and phosphate esters
[AD-A247778] p 3077 N92-27704
HYPERBOLIC DIFFERENTIAL EQUATIONS
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes
p 3103 N92-27678
HYPERBOLIC TRAJECTORIES
Design of fast earth-return trajectories from a lunar base
[AD-A246553] p 3053 N92-27530
HYPERSONIC AIRCRAFT
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898
HYPERSONIC BOUNDARY LAYER
Instability and transition in compressible boundary layers
[AD-A248596] p 3105 N92-28062
HYPERSONIC FLIGHT
Aerothermodynamics of nozzle flows for advanced hypersonic propulsion systems p 3099 N92-27478
Application of finite element method to hypersonic nozzle flow computations p 3099 N92-27479
HYPERSONIC FLOW
CFD contributions during hypersonic airplane intake design p 3098 N92-27472
Nonequilibrium 3D flows of air through inlets
p 3100 N92-27487
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
An experimental study of hypersonic flow development in a pipe
[UTIAS-TN-275] p 3103 N92-27683
HYPERSONIC INLETS
Comparative study of turbulence models in predicting hypersonic inlet flows
[NASA-TM-105720] p 3042 N92-28102
HYPERSONIC NOZZLES
Application of finite element method to hypersonic nozzle flow computations p 3099 N92-27479
HYPERSONIC VEHICLES
CFD contributions during hypersonic airplane intake design p 3098 N92-27472
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898
Robust intelligent flight control for hypersonic vehicles
[NASA-CR-185680] p 3051 N92-28209
HYPERSPHERES
The neutron-deuteron in hyperspherical formalism
[BONN-IR-91-13] p 3163 N92-27421
HYPERVELOCITY IMPACT
Micrometeoroids and debris on LDEF
p 3192 N92-27243
LDEF experiment M0003 meteoroid and debris survey
p 3192 N92-27245
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247
LDEF's map experiment foil perforations yield hypervelocity impact penetration parameters
p 3192 N92-27249
Hypervelocity impact facility for simulating materials exposure to impact by space debris
p 3192 N92-27250
Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252
Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment
p 3192 N92-27253
Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254
Elemental analyses of hypervelocity micro-particle impact sites on interplanetary dust experiment sensor surfaces p 3192 N92-27255
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps
p 3193 N92-27256
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257
SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2
p 3193 N92-27259
Further analysis of LDEF FRECOPA micrometeoroid remnants p 3193 N92-27260
Asteroidal versus cometary meteoroid impacts on the Long Duration Exposure Facility (LDEF)
p 3193 N92-27263
New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267
HYPERVELOCITY PROJECTILES
LDEF's map experiment foil perforations yield hypervelocity impact penetration parameters
p 3192 N92-27249
HYPERVENTILATION
Inspired gas composition influences recovery from experimental venous air embolism
[AD-A247004] p 3138 N92-28135
HYPOTHESES
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094

I

ICE ENVIRONMENTS
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247928] p 3125 N92-27846
ICE FLOES
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247928] p 3125 N92-27846
ICE FORMATION
Monthly mean sea ice data from the polar ice prediction system, the regional polar ice prediction system (Barents Sea), and the regional polar ice prediction system (Greenland Sea)
[AD-A246145] p 3134 N92-27574
IDENTIFYING
A proactive password checker
[NASA-CR-190438] p 3148 N92-27626
PET studies of components of high-level vision
[AD-A246449] p 3140 N92-27822
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916
Identification of driver gas-associated Bz events and prediction of their orientation
[AD-A248480] p 3194 N92-28059
IGNITION
Autoignition of single droplets of two-component liquid fuels
[CTN-92-60454] p 3071 N92-27634
A model for the autoignition of single liquid droplets at high pressure
[CTN-92-60493] p 3071 N92-27694
Analytical formula for ignition access condition in a magnetic fusion reactor
[PPL-114] p 3173 N92-27882
Operation path method for ignition criterion in a D-T tokamak reactor
[PPL-122] p 3174 N92-28193
IGNITION TEMPERATURE
Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194
IMAGE ANALYSIS
Meteoroid and debris special investigation group; status of 3-D crater analysis from binocular imagery
p 3192 N92-27251

Classification of SAR ship images with the aid of a syntactic pattern recognition algorithm
[DREO-TN-91-10] p 3084 N92-27695
Adaptive compression of multisensor image data
[AD-A248389] p 3151 N92-28006
Progress towards SAR based ecosystem analysis
p 3119 N92-28014
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016

IMAGE PROCESSING
Satellite image display and processing with microcomputers: A proof-of-concept for the Navy Oceanographic Data Distribution System (NODDS)
[AD-A247247] p 3118 N92-27214
Meteoroid and debris special investigation group; status of 3-D crater analysis from binocular imagery
p 3192 N92-27251
Enhancement of image processing capabilities for different environments
[AD-A246956] p 3145 N92-27333
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352
Fractal image encoding
[AD-A248003] p 3161 N92-27854
Distributed ray casting for high-speed volume rendering
[AD-A248167] p 3150 N92-27868
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
Adaptive compression of multisensor image data
[AD-A248389] p 3151 N92-28006
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050
Reconstruction based on flexible prior models
[DE92-011263] p 3118 N92-28214

IMAGE RECONSTRUCTION
Reconstruction based on flexible prior models
[DE92-011263] p 3118 N92-28214

IMAGE RESOLUTION
Integrated microwave and infrared precipitation analysis
[AD-A246070] p 3130 N92-27787
Area-of-interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863

IMAGES
PET studies of components of high-level vision
[AD-A246449] p 3140 N92-27822
UHF television reception: Ghost images from very large buildings
[BBC-RD-1992/1] p 3087 N92-28100

IMAGING RADAR
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan
p 3119 N92-28017
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada
p 3121 N92-28027

IMAGING SPECTROMETERS
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036

IMAGING TECHNIQUES
A design, fabrication and test of a precision positioning servo drive for a multiplexed imaging system
[AD-A246507] p 3106 N92-27630
Particle image velocimetry
[AD-A246638] p 3052 N92-27753
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada
p 3121 N92-28027
Calibration of a polarimetric imaging SAR
p 3088 N92-28032

IMMUNE SYSTEMS
Diminishing radiation damage and enhancing immune system recovery: A study
[DREO-CR-91-646] p 3137 N92-27702

IMPACT DAMAGE
LDEF's map experiment foil perforations yield hypervelocity impact penetration parameters
p 3192 N92-27249
Hypervelocity impact facility for simulating materials exposure to impact by space debris
p 3192 N92-27250
Elemental analyses of hypervelocity micro-particle impact sites on interplanetary dust experiment sensor surfaces p 3192 N92-27255
SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2
p 3193 N92-27259
Asteroidal versus cometary meteoroid impacts on the Long Duration Exposure Facility (LDEF)
p 3193 N92-27263
Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces
p 3193 N92-27264
Foreign object damage to tires operating in a wartime environment
[AD-A247195] p 3043 N92-27682

IMPACT STRENGTH
Correlation between fracture toughness, Charpy V-notch impact energy, and yield strength for ASTM A723 steel
[AD-A249142] p 3075 N92-28143

IMPACTORS
Further analysis of LDEF FRECOPA micrometeroid remnants p 3193 N92-27260

IMPULSES
Firing assembly for stored energy launcher
[AD-D015240] p 3054 N92-27628

IMPURITIES
Radioactivities induced in some LDEF samples
p 3164 N92-27225
Characterization of semi-insulating gallium arsenide
[AD-A246511] p 3177 N92-27632
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869

INCLUSIONS
A study of the microstructural basis for the strength and toughness properties of overaged HSLA-100 steel
[AD-A246955] p 3073 N92-27332

INCOMPRESSIBLE BOUNDARY LAYER
An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399

INCOMPRESSIBLE FLOW
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
Finite element methods for flow problems
p 3102 N92-27672
Finite element methods for fluids
p 3102 N92-27673
Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674

INDEPENDENT VARIABLES
Conditions for the applicability of the regenerative method
[AD-A248598] p 3160 N92-28182
Numerical treatment of differential and integral equations by the p and h-p versions of the finite element method
[AD-A247202] p 3158 N92-28189

INDEXES (DOCUMENTATION)
Aeronautical engineering: A continuing bibliography with indexes (supplement 277)
[NASA-SP-7037(277)] p 3035 N92-27929

INDIUM COMPOUNDS
Spectral properties of a novel laser crystal Y3(In, Ga)2Ga3O12:Cr3(+)
[AD-A246254] p 3175 N92-27201

INDUSTRIES
An assessment of the economic status of the antifriction bearing industry
[AD-A245373] p 3110 N92-27439
Statistical process control techniques for the telecommunications systems manager
[AD-A249122] p 3183 N92-28172

INERTIAL NAVIGATION
NAL Dornier 228-200 flight research airplane: Present status and outline of the installed equipment
[NAL-TM-637] p 3045 N92-27429

INFERENCE
Expert System Development (ESD) shell
[DE92-621018] p 3184 N92-27497
Determining rules for closing customer service centers: A public utility company's fuzzy decision
[NASA-CR-190390] p 3181 N92-27572
Scope ambiguity and inference
[AD-A247448] p 3148 N92-27591

INFORMATION
Reference frames in vision
[AD-A248743] p 3138 N92-27968
Product assurance planning in an environment of increased need for accountability
[DE92-010850] p 3115 N92-28055
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 3: The impact of a sponsor letter on mail survey response rates
[NASA-TM-107923] p 3185 N92-28112
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 8: The role of the information intermediary in the diffusion of aerospace knowledge
[NASA-TM-107949] p 3185 N92-28113

INFORMATION DISSEMINATION
Doing business with NASA
[NASA-NP-151] p 3182 N92-27843
United States Coast Guard operational information systems: Improving functionality and cross-functionality
[AD-A246900] p 3184 N92-27917
Reviews of computing technology: A review of compound document architectures
[DE92-011375] p 3151 N92-28048
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 8: The role of the information intermediary in the diffusion of aerospace knowledge
[NASA-TM-107949] p 3185 N92-28113
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 13: The information-seeking habits and practices of engineers
[NASA-TM-107931] p 3185 N92-28114
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 17: The relationship between seven variables and the use of US government technical reports by US aerospace engineers and scientists
[NASA-TM-107950] p 3186 N92-28115
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 15: Technical communications in the international workplace: Some implications for curriculum development
[NASA-TM-107926] p 3186 N92-28116
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 22: Establishing a research agenda for Scientific and Technical Information (STI): Focus on the user
[NASA-TM-107930] p 3186 N92-28117
Improving the impact of Federal scientific and technical information: A call for action p 3186 N92-28149
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 20: Engineers as information processors: A survey of US aerospace engineering faculty and students
[NASA-TM-107928] p 3186 N92-28155
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 21: Technological innovation and technical communications: Their place in aerospace engineering curricula. A survey of European, Japanese, and US Aerospace Engineers and Scientists
[NASA-TM-107929] p 3187 N92-28184
SPAN: Astronomy and astrophysics
[NASA-TM-107940] p 3192 N92-28185
SPAN: Ocean science
[NASA-TM-107939] p 3187 N92-28186
A communications model for an ISAS to NASA span link
[NASA-TM-107936] p 3088 N92-28187
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 19: Computer and information technology and aerospace knowledge diffusion
[NASA-TM-107927] p 3187 N92-28211
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research
[NASA-TM-107925] p 3187 N92-28220

INFORMATION FLOW
DoD implementation guidelines for Electronic Data Interchange (EDI), volume 1
[AD-A246613] p 3184 N92-27536
Applying the take-grant protection model
[NASA-CR-190439] p 3147 N92-27561
Design of a graphical user interface for a multimedia DBMS: Query Management Facility
[AD-A246397] p 3181 N92-27665
United States Coast Guard operational information systems: Improving functionality and cross-functionality
[AD-A246900] p 3184 N92-27917
Assimilation modeling of coastal transition zone data and continental slope flow fields
[AD-A248692] p 3135 N92-28010

INFORMATION MANAGEMENT
National airspace data interchange network analysis
[AD-A247345] p 3044 N92-27217
NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397
Airpower planning and battle management training at airbase level p 3031 N92-27889
Improving the impact of Federal scientific and technical information: A call for action p 3186 N92-28149

INFORMATION PROCESSING (BIOLOGY)
Norms and the perception of events
[AD-A247032] p 3138 N92-27337
What and where in visual attention: Evidence from the neglect syndrome
[AD-A246932] p 3139 N92-27509

Neural basis of motion perception
[AD-A248411] p 3141 N92-28050

INFORMATION RETRIEVAL

EnviroNET: An on-line environment data base for LDEF data p 3188 N92-27222

NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397

Compression and decompression of digital seismic waveform data for storage and communication
[DE92-621016] p 3183 N92-27496

Design of a graphical user interface for a multimedia DBMS: Query Management Facility
[AD-A246397] p 3181 N92-27665

Design and implementation of a multimedia DBMS: Complex query processing
[AD-A247054] p 3181 N92-27681

Natural language processing of captions for retrieving multimedia data
[AD-A247780] p 3184 N92-27860

Reviews of computing technology: A review of compound document architectures
[DE92-011375] p 3151 N92-28048

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 20: Engineers as information processors: A survey of US aerospace engineering faculty and students
[NASA-TM-107928] p 3186 N92-28155

INFORMATION SYSTEMS

Alternatives for developing user documentation for applications software
[AD-A247248] p 3145 N92-27215

Materials And Processes Technical Information System (MAPTIS) LDEF materials database p 3188 N92-27271

LDEF archival system plan p 3188 N92-27324

NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397

An information systems architecture analysis for Naval Air Systems Command
[AD-A247787] p 3184 N92-27885

Airpower planning and battle management training at airbase level p 3031 N92-27889

United States Coast Guard operational information systems: Improving functionality and cross-functionality
[AD-A246900] p 3184 N92-27917

A prototype climate information system
[AD-A245352] p 3131 N92-28039

Integrity in automated information systems
[AD-A245555] p 3185 N92-28040

Reviews of computing technology: A review of compound document architectures
[DE92-011375] p 3151 N92-28048

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 13: The information-seeking habits and practices of engineers
[NASA-TM-107931] p 3185 N92-28114

Improving the impact of Federal scientific and technical information: A call for action p 3186 N92-28149

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 20: Engineers as information processors: A survey of US aerospace engineering faculty and students
[NASA-TM-107928] p 3186 N92-28155

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 14: An analysis of the technical communications practices reported by Israeli and US aerospace engineers and scientists
[NASA-TM-107924] p 3186 N92-28183

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 21: Technological innovation and technical communications: Their place in aerospace engineering curricula. A survey of European, Japanese, and US Aerospace Engineers and Scientists
[NASA-TM-107929] p 3187 N92-28184

Information systems requirements for the microgravity science and applications program
[NASA-TM-107932] p 3081 N92-28203

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 19: Computer and information technology and aerospace knowledge diffusion
[NASA-TM-107927] p 3187 N92-28211

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research
[NASA-TM-107925] p 3187 N92-28220

INFORMATION THEORY

An investigation of the information propagation and entropy transport aspects of Stirling machine numerical simulation
[NASA-CR-189143] p 3105 N92-27975

INFORMATION TRANSFER

DoD implementation guidelines for Electronic Data Interchange (EDI), volume 1
[AD-A246613] p 3184 N92-27536

Applying the take-grant protection model
[NASA-CR-190439] p 3147 N92-27561

United States Coast Guard operational information systems: Improving functionality and cross-functionality
[AD-A246900] p 3184 N92-27917

Performance parameter methodology update for information delivery times
[AD-A248897] p 3185 N92-27997

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research
[NASA-TM-107925] p 3187 N92-28220

INFRARED ASTRONOMY

Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147

INFRARED ASTRONOMY SATELLITE

Identification and study of HII regions in the IRAS point source catalog
[ISBN-0-315-61537-0] p 3189 N92-27700

INFRARED DETECTORS

Heterostructure device useable as a far infrared photodetector --- semiconductor devices
[AD-D015217] p 3168 N92-27616

A design, fabrication and test of a precision positioning servo drive for a multiplexed imaging system
[AD-A246507] p 3106 N92-27630

Infrared horizon detection
[AD-A246904] p 3084 N92-27717

Monolithic integration of semiconductor and superconductor components
[AD-A248952] p 3092 N92-28067

INFRARED IMAGERY

Satellite image display and processing with microcomputers: A proof-of-concept for the Navy Oceanographic Data Distribution System (NODDS)
[AD-A247247] p 3118 N92-27214

Three-dimensional Ocean Thermal Structure (TOTS) software module software requirements specifications
[AD-A246146] p 3134 N92-27575

Integrated microwave and infrared precipitation analysis
[AD-A246070] p 3130 N92-27787

INFRARED RADIATION

Spectral infrared hemispherical reflectance measurements for LDEF tray clamps p 3170 N92-27295

Laser physics and laser techniques
[AD-A247326] p 3107 N92-27354

Infrared horizon detection
[AD-A246904] p 3084 N92-27717

Integrated microwave and infrared precipitation analysis
[AD-A246070] p 3130 N92-27787

Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147

INFRARED SCANNERS

Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026

Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036

INFRARED SIGNATURES

Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881

INFRARED SOURCES (ASTRONOMY)

Identification and study of HII regions in the IRAS point source catalog
[ISBN-0-315-61537-0] p 3189 N92-27700

INFRARED SPECTRA

Identification and study of HII regions in the IRAS point source catalog
[ISBN-0-315-61537-0] p 3189 N92-27700

Atomic-level structure and dynamics of ordered metal electrodes as probed by infrared spectroscopy and scanning tunneling microscopy
[AD-A246738] p 3164 N92-28105

INFRARED SPECTROMETERS

Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026

Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036

INFRARED SPECTROSCOPY

Atomic-level structure and dynamics of ordered metal electrodes as probed by infrared spectroscopy and scanning tunneling microscopy
[AD-A246738] p 3164 N92-28105

Chemical analysis of aromatics in diesel fuels
[PB92-167311] p 3072 N92-28207

INFRARED WINDOWS

Advanced tactical aircraft early risk reduction phase 1 broad band IR window study
[AD-A246633] p 3046 N92-27982

INJECTORS

The FML compressor as a drive system for the LFSWT: A narrative p 3052 N92-27978

INJURIES

Ergonomics manual
[AD-A246934] p 3143 N92-28071

INLET FLOW

Comparative study of turbulence models in predicting hypersonic inlet flows
[NASA-TM-105720] p 3042 N92-28102

Steady and transient analysis of flows exhibiting strong viscous/inviscid interaction (Composite RNS procedures)
[AD-A247171] p 3105 N92-28175

INPUT/OUTPUT ROUTINES

An expert system for measuring, interpreting, and managing system performance factors for the work information management system
[AD-A246878] p 3182 N92-27824

INSERTION

Compiler-assisted static checkpoint insertion
[AD-A246496] p 3145 N92-27211

INSPECTION

Evaluation of long-duration exposure to the natural space environment on the mechanical properties of carbon-reinforced epoxy and polyimide composites p 3070 N92-27291

Methodology for the determination of criticality codes and recertification intervals for Tank Mounted Air Compressors (TMAC) and Base Mounted Air Compressors (BMAC)
[NASA-CR-189268] p 3114 N92-27649

Human factors evaluation of the work environment of operators engaged in the inspection and repair of aging aircraft
[AD-A246445] p 3043 N92-27914

INSTALLING

Panel installation development in Automated Structures Assembly Lab p 3156 N92-27777

INSTRUMENT ERRORS

Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559

Estimation of cable-mounted model inertia characteristics for dynamic wind-tunnel test
[NAL-TM-641] p 3042 N92-28152

INSTRUMENT FLIGHT RULES

Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant p 3032 N92-27895

INSTRUMENT PACKAGES

Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004

INTAKE SYSTEMS

CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450

Nonequilibrium 3D flows of air through inlets p 3100 N92-27487

INTEGRAL EQUATIONS

Numerical treatment of differential and integral equations by the p and h-p versions of the finite element method
[AD-A247202] p 3158 N92-28189

INTEGRAL ROCKET RAMJETS

Design and testing of a caseless solid-fuel integral-rocket ramjet engine for use in small tactical missiles
[AD-A246226] p 3066 N92-27198

INTEGRALS

A procedure for obtaining an algebraic approximation to certain integrals
[AD-A245371] p 3157 N92-27437

Numerical treatment of differential and integral equations by the p and h-p versions of the finite element method
[AD-A247202] p 3158 N92-28189

INTEGRATED CIRCUITS

Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology
[AD-A246989] p 3089 N92-27401

Process for making semiconductor-on-insulator device interconnects
[AD-D015208] p 3089 N92-27445

The para radiation effects current simulator
[AD-A248652] p 3108 N92-27993

Parasitic free switched capacitor composite operational amplifiers
[AD-A246258] p 3093 N92-28167

INTEGRATED OPTICS

High speed interdigital MSM photodiodes
[ISBN-0-315-57980-3] p 3090 N92-27639

Integrated optical pipelined polynomial processors
[AD-A248573] p 3092 N92-27992

Fiber-optic gyroscope p 3087 N92-28092

INTELLIGENCE
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
Individual differences in adaptive processing in complex learning and cognitive performance
[AD-A248586] p 3142 N92-28179

INTERATOMIC FORCES
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122

INTERFERENCE DRAG
Aircraft drag reduction p 3036 N92-27709

INTERFEROMETERS
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288
Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696
Dual frequency along-track interferometry
p 3088 N92-28024
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038

INTERFEROMETRY
Optically stable, large time bandwidth acousto-optic heterodyne spectrum analyzer with fixed non-zero heterodyne output
[AD-D015223] p 3163 N92-27998
Dual frequency along-track interferometry
p 3088 N92-28024
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038
Fiber-optic gyroscope p 3087 N92-28092

INTERIOR BALLISTICS
Erosion in a 20-mm-gun produced by normal and LOVA propellant charges
[ISL-CO-215/89] p 3080 N92-27927

INTERMETALLICS
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246836] p 3075 N92-28119

INTERNAL PRESSURE
Fatigue life improvement of an autofrettage thick-walled pressure vessel with an external groove
[AD-A247233] p 3115 N92-27213

INTERNAL WAVES
Magnetic fields generated by internal ocean seawater motion
[AD-A246589] p 3132 N92-27502

INTERNATIONAL COOPERATION
Global climate change and international security
[DE92-010868] p 3125 N92-28056

INTERPLANETARY DUST
Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment
p 3192 N92-27253
Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254
Elemental analyses of hypervelocity micro-particle impact sites on interplanetary dust experiment sensor surfaces p 3192 N92-27255
Interplanetary meteoroid debris in LDEF metal craters
p 3193 N92-27258
Further analysis of LDEF FRECOPA micrometeroid remnants p 3193 N92-27260

INTERPOLATION
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434

INTERPROCESSOR COMMUNICATION
Local Area Network (LAN) compatibility issues
[AD-A247249] p 3153 N92-27212

INTERSTELLAR GAS
The interstellar gas experiment: Analysis in progress
p 3145 N92-27266
A study of the diffuse interstellar medium through neutral hydrogen absorption observations toward pulsars
[ISBN-0-315-54703-0] p 3189 N92-27644
Self-similar spiral structure in astrophysical disks
[ISBN-0-315-61539-7] p 3191 N92-27701

INTERSTELLAR MATTER
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640
Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147

INTERSTELLAR RADIATION
Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147

INTRAVEHICULAR ACTIVITY
IVA robotics for Space Station Freedom
p 3155 N92-27766

INVENTIONS
Dynamic test apparatus for electro-rheological fluids
[AD-D015201] p 3106 N92-27823

INVENTORIES
A study of the Air Force's exception management process: Its effect on customer service and order processing
[AD-A246627] p 3183 N92-27981

INVENTORY CONTROLS
A study of the Air Force's exception management process: Its effect on customer service and order processing
[AD-A246627] p 3183 N92-27981

INVENTORY MANAGEMENT
A study of the Air Force's exception management process: Its effect on customer service and order processing
[AD-A246627] p 3183 N92-27981

INVERSIONS
Acoustic tomography in the Greenland Sea
[AD-A246574] p 3133 N92-27533

INVISCID FLOW
A fast, uncoupled, compressible, two-dimensional, unsteady boundary layer algorithm with separation for engine inlets
[NASA-TM-105686] p 3102 N92-27653
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947
Steady and transient analysis of flows exhibiting strong viscous/inviscid interaction (Composite RNS procedures)
[AD-A247171] p 3105 N92-28175

IODINE LASERS
Nuclear-driven flashlamp pumping of the atomic iodine laser
[DE92-010609] p 3107 N92-27393

ION BEAMS
Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252

ION IMPLANTATION
Materials processing of diamond: Etching, doping by ion implantation and contact formation
[AD-A248447] p 3078 N92-28148

ION PROBES
Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004

ION RECOMBINATION
Hydrogenic ion recombination
[AD-A246886] p 3072 N92-28145

ION TEMPERATURE
Local kinetic analysis of low frequency electrostatic modes in tokamaks
[PPL-110] p 3172 N92-27449
Electromagnetic and kinetic effects on the ion temperature gradient mode
[PPL-113] p 3175 N92-28198
Effects of kinetic damping on the ion temperature gradient mode in tokamaks
[PPL-105] p 3175 N92-28204

IONIZING RADIATION
Status of LDEF ionizing radiation measurements and analysis p 3196 N92-27223
Revised predictions of LDEF exposure to trapped protons p 3164 N92-27229
Absorbed dose measurements and predictions on LDEF p 3165 N92-27232
Development and application of a 3-D geometry/mass model for LDEF satellite ionizing radiation assessments
p 3165 N92-27236
Criticality of Be-7 concentration in LDEF
p 3165 N92-27238
Future directions for LDEF ionizing radiation modeling and assessments p 3165 N92-27242
Investigation of alpha particle induced single-event upsets in charge-coupled devices
[AD-A246268] p 3090 N92-27662

IONOGRAMS
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434

IONOSONDES
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434

IONOSPHERIC DISTURBANCES
Activities, accomplishments and research progress of the Center for Theoretical Geoplasma Physics, Center for Space Research, Massachusetts Inst. of Technology
[AD-A248572] p 3127 N92-27963
Survivability of meteor burst communication under adverse operating conditions
[AD-A248632] p 3085 N92-28065

IONS
Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004

IRAQ
Dust and sand forecasting in Iraq and adjoining countries
[AD-A247588] p 3129 N92-27551

IRON ISOTOPES
New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876

IRRADIATION
The para radiation effects current simulator
[AD-A248652] p 3106 N92-27993

ISOCYANATES
Investigation of polyisocyanates as second harmonic generating materials
[DE92-010445] p 3089 N92-27366

ISOMORPHISM
Deformations of complex structures on gamma/SL2(C) and cohomology of local systems p 3161 N92-27556

ISOTHERMAL PROCESSES
Kolmogorov spectra in a finite pressure plasma
[DE92-621531] p 3174 N92-28044

ISOTOPE EFFECT
Anomalous electron thermal diffusivity, anomalous particle pinch, and isotope effect due to the skin size electromagnetic drift mode
[PPL-116] p 3173 N92-27883
Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region
[AD-A248612] p 3072 N92-28064

ITERATION
Iterative methods for estimation of 2-D AR parameters using a data-adaptive Toeplitz approximation algorithm
[AD-A246009] p 3151 N92-28049
Research and development of the p-version of the finite element model
[AD-A248582] p 3158 N92-28060

ITERATIVE SOLUTION
Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674
Iterative methods for estimation of 2-D AR parameters using a data-adaptive Toeplitz approximation algorithm
[AD-A246009] p 3151 N92-28049
Computational methods for stellerator configurations
[DE92-011131] p 3174 N92-28057
Phase modeling of a parallel scientific code
[DE92-010292] p 3154 N92-28173

J

JAMMING
Performance of a fast frequency-hopped noncoherent MFSK receiver with ratio-statistic combining over Rician fading channels with partial-band interference
[AD-A247034] p 3082 N92-27339
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785

JET FLOW
Effect of collector configuration on test section turbulence levels in an open-jet wind tunnel
[NASA-TM-4333] p 3051 N92-27670
Propulsion simulator for magnetically suspended wind tunnel models p 3052 N92-27801

JET MIXING FLOW
Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485
Experimental study of cross-stream mixing in a rectangular duct
[NASA-TM-105694] p 3049 N92-27652
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853

JET NOZZLES
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450

JET PROPULSION
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450

JOINTS (JUNCTIONS)
Analysis and testing of a space crane articulating joint testbed p 3156 N92-27773
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246836] p 3075 N92-28119

JP-4 JET FUEL
The effect of jet fuel exposure on advanced aerospace composites. Part 1: Thermal and chemical analysis
[AD-A246559] p 3068 N92-27531

JUNCTION TRANSISTORS
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging
[AD-A246429] p 3088 N92-27204

K

K-EPSILON TURBULENCE MODEL
Finite element solution of viscous compressible flows in gas turbine ducts and diffusers p 3099 N92-27477
Three dimensional flow in sharp bends — ducted flow p 3099 N92-27481
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle p 3100 N92-27482
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber p 3050 N92-27484

KALMAN FILTERS
Frequency, amplitude, and phase tracking of nonsinusoidal signal in noise with extended Kalman filter [AD-A246928] p 3090 N92-27508
Effects of non-normal outlier-prone error distribution on Kalman filter track [AD-A247036] p 3162 N92-28146

KAPTON (TRADEMARK)
Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292

KEELS
Radioactivities induced in some LDEF samples p 3164 N92-27225

KINEMATIC EQUATIONS
The tensor equation AX + XA = G [AD-A246665] p 3157 N92-27762

KINEMATICS
New results from FRECOPA analysis — long duration exposure facility p 3111 N92-27304

KINETIC ENERGY
An experimental investigation of the separating/reattaching flow over a backstep [NASA-CR-190426] p 3035 N92-27399
Some advances in US space defense systems [AD-A246038] p 3160 N92-27658
A study of compressible turbulence [AD-A247001] p 3105 N92-27986

KINETIC EQUATIONS
Local kinetic analysis of the ballooning mode in tokamaks [PPL-111] p 3175 N92-28197
Microballooning mode in tokamaks [PPL-107] p 3175 N92-28205

KINETICS
Computer graphics for bearing dynamic analysis [AD-A247567] p 3148 N92-27584

KNOWLEDGE
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 8: The role of the information intermediary in the diffusion of aerospace knowledge [NASA-TM-107949] p 3185 N92-28113
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 15: Technical communications in the international workplace: Some implications for curriculum development [NASA-TM-107926] p 3186 N92-28116
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 22: Establishing a research agenda for Scientific and Technical Information (STI): Focus on the user [NASA-TM-107930] p 3186 N92-28117
Research into the development of a knowledge acquisition taxonomy [NASA-CR-189939] p 3152 N92-28150

KNOWLEDGE BASES (ARTIFICIAL INTELLIGENCE)
Automated generation of three-dimensional virtual worlds for task explanation [AD-A247859] p 3154 N92-27389
Determining rules for closing customer service centers: A public utility company's fuzzy decision [NASA-CR-190390] p 3181 N92-27572
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant p 3032 N92-27895
Parallel knowledge based systems architectures for in-flight mission management p 3034 N92-27904
Knowledge-based natural language understanding: A AAAI-87 survey talk [AD-A249120] p 3151 N92-28068
Research into the design and implementation of knowledge-base system [AD-A247039] p 3151 N92-28075
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 19: Computer and information technology and aerospace knowledge diffusion [NASA-TM-107927] p 3187 N92-28211

KNOWLEDGE REPRESENTATION
Expert System Development (ESD) shell [DE92-621018] p 3184 N92-27497
The TRAINS project [AD-A247447] p 3181 N92-27590
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant p 3032 N92-27895
The RHET system: A sequence of self-guided tutorials [AD-A248960] p 3151 N92-28082

KOLMOGOROFF THEORY
Kolmogorov spectra in a finite pressure plasma [DE92-621531] p 3174 N92-28044

KURTOSIS
Integrated microwave and infrared precipitation analysis [AD-A246070] p 3130 N92-27787

L

LABORATORIES
Institute for Mechanical Engineering [CTN-92-60489] p 3081 N92-27692

LABRADOR
Review of the physical oceanography of the Labrador Sea [CGCR-90-12] p 3132 N92-27357

LACQUERS
High temperature silicide protective coating slurry [AD-D015194] p 3076 N92-27491

LAKE ONTARIO
Hindcast wave information for the great lakes: Lake Ontario [AD-A246446] p 3135 N92-27820

LAMINAR BOUNDARY LAYER
Aircraft drag reduction p 3036 N92-27709

LAMINAR FLOW
Validation of non-orthogonal three-dimensional laminar flow predictions p 3098 N92-27476
Special Course on Skin Friction Drag Reduction [AGARD-R-786] p 3036 N92-27706
Basic concepts on boundary layers p 3036 N92-27707
Laminar-turbulent transition: Fundamentals p 3036 N92-27710
Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios [AD-A246057] p 3104 N92-27828
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle [NASA-CR-188055] p 3052 N92-27976
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle p 3052 N92-27977
The FML compressor as a drive system for the LFSWT: A narrative p 3052 N92-27978

LAMINATES
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology [AD-A246989] p 3089 N92-27401
Residual thermal stresses in graphite/PEEK (APC-2) laminates [AD-A247450] p 3077 N92-27592
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films [AD-A246483] p 3077 N92-27837
A preliminary study on damage detection using piezoelectric film [AD-A246350] p 3046 N92-28118

LANDAU DAMPING
Electromagnetic and kinetic effects on the ion temperature gradient mode [PPL-113] p 3175 N92-28198
Effects of kinetic damping on the ion temperature gradient mode in tokamaks [PPL-105] p 3175 N92-28204

LANDFORMS
Interpretation of time domain electromagnetic soundings near geological contacts [DE92-010467] p 3126 N92-27347

LANTHANUM COMPOUNDS
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C [AD-A247880] p 3071 N92-27514

LARGE SPACE STRUCTURES
Ground vibration tests of a high fidelity truss for verification of on orbit damage location techniques [NASA-TM-107626] p 3115 N92-27375
Optimal control of large space structures using distributed gyricity: A continuum approach [ISBN-0-315-56953-0] p 3056 N92-27612
Automation and Robotics for Space-Based Systems, 1991 [NASA-CP-10098] p 3154 N92-27763
A space crane concept for performing on-orbit assembly p 3155 N92-27772
Automated assembly of large space structures p 3156 N92-27774
Development of a machine vision guidance system for automated assembly of space structures p 3156 N92-27775
Panel installation development in Automated Structures Assembly Lab p 3156 N92-27777
Executive system software design and expert system implementation p 3152 N92-27778
Future work in automated assembly of large space structures p 3156 N92-27779
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms p 3113 N92-27780
Development of a truss joint for robotic assembly of space structures [NASA-TP-3214] p 3117 N92-27974

LARMOR RADIUS
Electromagnetic and kinetic effects on the ion temperature gradient mode [PPL-113] p 3175 N92-28198

LASER ABLATION
Physics and diagnostics of laser ablation plume propagation for high-(Tc) superconductor film growth [DE92-009386] p 3171 N92-27362

LASER ANEMOMETERS
Radial inflow turbine study [AD-A246938] p 3049 N92-28073

LASER APPLICATIONS
Laser physics and laser techniques [AD-A247326] p 3107 N92-27354
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques [AD-A246399] p 3162 N92-27751
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
Adaptive compression of multisensor image data [AD-A248389] p 3151 N92-28006
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry [AD-A248410] p 3072 N92-28009
Kinetics of surface reactions studied by laser desorption with FTMS detection [AD-A248412] p 3109 N92-28051
Large second-harmonic response of C60 thin films [AD-A248957] p 3092 N92-28080
Development and utilization of the University of California, Santa Barbara, free-electron laser [AD-A248733] p 3109 N92-28124
Development and scientific utilization of the University of California, Santa Barbara free-electron laser [AD-A246803] p 3109 N92-28131

LASER BEAMS
Laser physics and laser techniques [AD-A247326] p 3107 N92-27354
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers [AD-A247574] p 3108 N92-27566
Bi-directional optical transmission system for RF electrical energy [AD-D015224] p 3169 N92-27999

LASER CAVITIES
Nuclear-driven flashlamp pumping of the atomic iodine laser [DE92-010609] p 3107 N92-27393
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers [AD-A246037] p 3108 N92-27657

LASER DOPPLER VELOCIMETERS
Particle image velocimetry [AD-A246638] p 3052 N92-27753

LASER HEATING
A study of the gas-phase chemistry of solid propellant ingredients using CO2 laser heating [AD-A246510] p 3080 N92-27631

LASER MATERIALS
Nuclear-driven flashlamp pumping of the atomic iodine laser [DE92-010609] p 3107 N92-27393

LASER OUTPUTS
Solid state research [AD-A247338] p 3176 N92-27216
A comparison of the measured and modelled effects of brewster angle anisotropies upon pulsed XeCl excimer laser output [ISBN-0-315-49569-3] p 3109 N92-27698
Fluctuations and squeezing in resonance fluorescence emitted near a phase conjugator [AD-A248735] p 3170 N92-28125

LASER PLASMA INTERACTIONS
Transport in ultra-dense plasmas produced by a picosecond laser pulse [AD-A247827] p 3174 N92-27921

LASER PLASMAS
Transport in ultra-dense plasmas produced by a picosecond laser pulse [AD-A247827] p 3174 N92-27921

LASER PUMPING
Holmium laser pumped with a neodymium laser
[AD-D015220] p 3108 N92-27617
LASER RANGE FINDERS
Pascal software for CO2-Laserradar ranging with a HP9000 computer
[AD-A245383] p 3108 N92-27443
LASER SPECTROSCOPY
Spectroscopy, reaction, and photodissociation in highly vibrationally excited molecules
[DE92-010651] p 3163 N92-27396
LASER STABILITY
Laser physics and laser techniques
[AD-A247326] p 3107 N92-27354
LASER TARGET DESIGNATORS
Advanced tactical aircraft early risk reduction phase 1 broad band IR window study
[AD-A246633] p 3046 N92-27982
LASER TARGETS
Laser radar system demonstration: System requirements review, second demonstration receiver
[AD-A246159] p 3108 N92-27601
LASER WEAPONS
Some advances in US space defense systems
[AD-A246038] p 3160 N92-27658
LASERS
Laboratory measurements of the transmission and scattering of laser beams in optically dense clouds
[ISBN-0-315-58085-2] p 3108 N92-27647
LASING
Nuclear-driven flashlamp pumping of the atomic iodine laser
[DE92-010609] p 3107 N92-27393
LATENT HEAT
The effect of latent heat release on the ERICA IOP-5 cyclone
[AD-A245779] p 3130 N92-27912
LATERAL CONTROL
Progress of magnetic suspension and balance systems for wind tunnels in the USSR p 3053 N92-27803
LAUNCHERS
Investigation of battery charged capacitor pulsed power systems for electromagnetic launcher experiments
[AD-A247325] p 3089 N92-27353
Electrically actuated multiple store launcher
[AD-D015247] p 3054 N92-27374
Fuzzy guidance system evaluation
p 3034 N92-27903
LAUNCHING
Electrically actuated multiple store launcher
[AD-D015247] p 3054 N92-27374
LEAD (METAL)
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246836] p 3075 N92-28119
LEAD COMPOUNDS
The relevance of the DeBroglie velocity (V1 = h/2md1) to shock loading induced reactions in lead azide
[AD-A246478] p 3177 N92-27607
LEAD OXIDES
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012
LEADERSHIP
Statistical process control techniques for the telecommunications systems manager
[AD-A249122] p 3183 N92-28172
LEADING EDGES
SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2
p 3193 N92-27259
LDEF thermal control coatings post-flight analysis
p 3078 N92-27276
LEAKAGE
A computational study of tip leakage flow and losses in a linear turbine cascade p 3095 N92-27453
LEARNING
Fourth conference on the neurobiology of learning and memory
[AD-A247174] p 3140 N92-27538
Causal models in the acquisition and instruction of programming skills
[AD-A248761] p 3141 N92-27969
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
An experimental study in the use of computer-based instruction to teach automated spreadsheet functions
[AD-A246728] p 3152 N92-28104
Individual differences in adaptive processing in complex learning and cognitive performance
[AD-A248586] p 3142 N92-28179
LEARNING THEORY
Fourth conference on the neurobiology of learning and memory
[AD-A247174] p 3140 N92-27538
Designing a graphical user interface for a bilateral negotiation support system
[AD-A247910] p 3150 N92-27848
LEAST SQUARES METHOD
Meteoroid and debris special investigation group; status of 3-D crater analysis from binocular imagery
p 3192 N92-27251
Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674
LEVITATION
Edge effects on forces and magnetic fields produced by a conductor moving past a magnet
[DE92-010502] p 3161 N92-27411
Levitation of YBa2Cu3O(7-x) superconductor in a variable magnetic field p 3059 N92-27735
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747
Cryogenic test rig with an aerodynamic magnetically levitated carriage p 3052 N92-27792
Precise positioning and compliance synthesis for automatic assembly using Lorentz levitation
p 3062 N92-27797
Change in the coil distribution of electrodynamic suspension system p 3064 N92-27806
The large-angle magnetic suspension test fixture
p 3065 N92-27816
LIAPUNOV FUNCTIONS
Some basic research problems related to energy
[DE92-011220] p 3072 N92-28043
LIBRARIES
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 20: Engineers as information processors: A survey of US aerospace engineering faculty and students
[NASA-TM-107928] p 3186 N92-28155
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 14: An analysis of the technical communications practices reported by Israeli and US aerospace engineers and scientists
[NASA-TM-107924] p 3186 N92-28183
LIE GROUPS
Introduction to the differential geometry of quantum groups
[DE92-010476] p 3161 N92-27348
Deformations of complex structures on gamma/SL2(C) and cohomology of local systems p 3161 N92-27556
A simple example of modeling hybrid systems using bialgebras: Preliminary version
[NASA-CR-190331] p 3157 N92-27557
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
LIFE (DURABILITY)
Computer software project management: An introduction
[AD-A246147] p 3147 N92-27576
Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827
Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update
[NASA-TM-105689] p 3067 N92-27878
LIFE CYCLE COSTS
An appraisal of cost-effectiveness models used in the Air Force and Navy aircraft engine component improvement programs
[AD-A245910] p 3049 N92-28162
LIFE SCIENCES
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 361)
[NASA-SP-7011(361)] p 3137 N92-27433
LIFE SUPPORT SYSTEMS
Johnson Space Center's regenerative life support systems test bed
[NASA-TM-107943] p 3144 N92-28157
LIFT
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation
p 3039 N92-27944
Evaluation of high lift devices of the quiet STOL experimental aircraft ASKA
[NAL-TR-1102] p 3046 N92-28153
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190
LIFT DRAG RATIO
Aircraft drag reduction p 3036 N92-27709
LIGHT AMPLIFIERS
Space division switches based on semiconductor optical amplifiers
[AD-A247619] p 3176 N92-27598
Space-division optical switches based on semiconductor optical amplifiers
[AD-A247616] p 3167 N92-27608
Active fibres and optical amplifiers
p 3086 N92-28089
LIGHT BEAMS
Fiber-optic remote angular position sensor including a polarization track
[AD-D015210] p 3169 N92-27838
Bi-directional optical transmission system for RF electrical energy
[AD-D015224] p 3169 N92-27999
LIGHT GAS GUNS
Further analysis of LDEF FRECOPA micrometeroid remnants p 3193 N92-27260
LIGHT IONS
Light-heavy ion measurements in CR-39 located on the Earth side of LDEF p 3165 N92-27234
LIGHT MODULATION
Minimum polarization modulation: A highly bandwidth efficient coherent optical modulation scheme
[AD-A247556] p 3167 N92-27596
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094
LIGHT SCATTERING
Diamond as an optical material
[AD-A247628] p 3167 N92-27599
LIGHT TRANSMISSION
Multiple-wavelength transmission measurements in rocket motor plumes
[AD-A245999] p 3067 N92-27521
Minimum polarization modulation: A highly bandwidth efficient coherent optical modulation scheme
[AD-A247556] p 3167 N92-27596
Diamond as an optical material
[AD-A247628] p 3167 N92-27599
Bi-directional optical transmission system for RF electrical energy
[AD-D015224] p 3169 N92-27999
LIGHTING EQUIPMENT
NPSNET: Physically-based modeling enhancements to an object file format
[AD-A246594] p 3146 N92-27504
LIGHTNING
Location and characterization of in-cloud lightning currents by multiple station VHF and electric field measurements
[AD-A247051] p 3131 N92-27988
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data
[AD-A248377] p 3085 N92-28003
LINE OF SIGHT
Comparison of Janus and field test aircraft detection ranges for the line-of-sight forward heavy system
[AD-A246047] p 3083 N92-27600
LINEAR ACCELERATORS
SLAC B Factory computing
[DE92-010745] p 3154 N92-27368
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A246399] p 3162 N92-27751
LINEAR ENERGY TRANSFER (LET)
Charge, energy, and LET spectra measurements of charged particles in P0006 experiment of LDEF
p 3165 N92-27233
LINEAR SYSTEMS
Finite element methods for fluids
p 3102 N92-27673
Precision magnetic suspension linear bearing
p 3057 N92-27727
LINES OF FORCE
All-optical fiber Faraday rotation current sensor with heterodyne detection technique
[AD-D015226] p 3170 N92-28001
LIOUVILLE EQUATIONS
Phenomena unique to sub-micrometer devices
[AD-A246655] p 3091 N92-27759
Numerical simulation of the function of scientific instrumentation for measuring the speed of electron devices
[AD-A247006] p 3093 N92-28137
LIPID METABOLISM
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

LIPIDS
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989
LIQUID COOLING
Enhancement of boiling heat transfer in di-electric fluids
[AD-A245962] p 3105 N92-28058
LIQUID CRYSTALS
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
Advanced materials for turbomachinery. Technical memo number 2: Advanced materials compatibility with storable propellants (monomethyl hydrazine and nitrogen tetroxide)
[AD-A246725] p 3080 N92-28070
LIQUID FUELS
Autoignition of single droplets of two-component liquid fuels
[CTN-92-60454] p 3071 N92-27634
A model for the autoignition of single liquid droplets at high pressure
[CTN-92-60493] p 3071 N92-27694
LIQUID HELIUM
Magnetic suspension using high temperature superconducting cores p 3061 N92-27789
LIQUID HYDROGEN
An experimental study of a small high speed LH2 rocket pump: A suppression method of asynchronous shaft vibrations
[NAL-TR-1118] p 3110 N92-27431
LIQUID NITROGEN
Magnetic suspension using high temperature superconducting cores p 3061 N92-27789
LIQUID PHASE SINTERING
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819
LIQUID PROPELLANT ROCKET ENGINES
Propulsion systems using in situ propellants for a Mars ascent vehicle
[NASA-TM-105741] p 3067 N92-27654
LIQUID ROCKET PROPELLANTS
Propulsion systems using in situ propellants for a Mars ascent vehicle
[NASA-TM-105741] p 3067 N92-27654
LIQUID-SOLID INTERFACES
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246836] p 3075 N92-28119
LITHIUM CHLORIDES
Lithium rechargeable cell with a polymer cathode
[AD-A247577] p 3090 N92-27567
LITHIUM FLUORIDES
Measurements of the radiation dose to LDEF by means of passive dosimetry p 3165 N92-27230
LITHIUM NIOBATES
Holographic data storage crystals for the LDEF --- long duration exposure facility p 3178 N92-27313
LITHOGRAPHY
Quantum devices
[AD-A247795] p 3177 N92-27705
Computed tomography analysis of castings
[AD-A249099] p 3074 N92-28053
LOAD TESTS
Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318
[DE92-009408] p 3117 N92-28041
LOADS (FORCES)
Bivariate extreme value distributions
[NASA-CR-4444] p 3159 N92-27588
Cracks on or near an interface p 3116 N92-27643
Effect of flux penetration on the load capacity of passive superconducting bearings p 3061 N92-27790
Fabric-stress-deformation relations in granular materials
[AD-A247009] p 3117 N92-28138
Life prediction methodologies for composite materials
[AD-A248637] p 3070 N92-28202
LOCAL AREA NETWORKS
Local Area Network (LAN) compatibility issues
[AD-A247249] p 3153 N92-27212
Local area networks with fiber optics
[AD-A247033] p 3166 N92-27338
Design and implementation of a fiber optic token-ring local area network
[AD-A245364] p 3167 N92-27435
STARNET: An integrated services broadband optical network with physical star topology
[AD-A247555] p 3167 N92-27595
Implementation of a configuration management system for a local area network
[AD-A246474] p 3153 N92-27605
Coherent communications --- fiber optics applications p 3086 N92-28086
High speed local area networks p 3086 N92-28087
LOGIC CIRCUITS
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging
[AD-A246429] p 3088 N92-27204
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005
LOGIC DESIGN
A formal model of asynchronous communication and its use in mechanically verifying a biphase mark protocol
[NASA-CR-4433] p 3153 N92-27586
LOGISTICS
A study of the Air Force's exception management process: Its effect on customer service and order processing
[AD-A246627] p 3183 N92-27981
LOGISTICS MANAGEMENT
A study of the Air Force's exception management process: Its effect on customer service and order processing
[AD-A246627] p 3183 N92-27981
LONG DURATION EXPOSURE FACILITY
Second LDEF Post-Retrieval Symposium abstracts
[NASA-CP-10097] p 3196 N92-27218
Attitude stability of LDEF: Refinement of results from the silver pinhole camera p 3066 N92-27219
LDEF microenvironments, observed and predicted p 3066 N92-27220
A generalized approach to the thermal analysis of the Long Duration Exposure Facility's flight experiments p 3179 N92-27221
EnviroNET: An on-line environment data base for LDEF data p 3188 N92-27222
Status of LDEF ionizing radiation measurements and analysis p 3196 N92-27223
Sensitivity of LDEF foil analyses using ultra-low background germanium versus large NaI(T1) multidimensional spectrometers p 3196 N92-27224
Radioactivities induced in some LDEF samples p 3164 N92-27225
A photon-phreak digs the LDEF happening p 3164 N92-27226
Collection, analysis, and archival of LDEF activation data p 3188 N92-27227
Induced activation study of LDEF p 3164 N92-27228
Revised predictions of LDEF exposure to trapped protons p 3164 N92-27229
Measurements of the radiation dose to LDEF by means of passive dosimetry p 3165 N92-27230
LDEF: Dosimetric measurement results (AO 138-7 experiment) p 3165 N92-27231
Absorbed dose measurements and predictions on LDEF p 3165 N92-27232
Charge, energy, and LET spectra measurements of charged particles in P0006 experiment of LDEF p 3165 N92-27233
Light-heavy ion measurements in CR-39 located on the Earth side of LDEF p 3165 N92-27234
Three-dimensional shielding effects on charged particle fluences measured in the P0006 experiment in LDEF p 3165 N92-27235
Development and application of a 3-D geometry/mass model for LDEF satellite ionizing radiation assessments p 3165 N92-27236
Radiation model predictions and validation using LDEF data p 3165 N92-27237
Criticality of Be-7 concentration in LDEF p 3165 N92-27238
Cosmogenic radioisotopes on LDEF surfaces p 3165 N92-27239
Heavy Ions In Space (HIIS) experiment p 3165 N92-27240
Ultra heavy cosmic ray experiment (A0178) p 3196 N92-27241
Future directions for LDEF ionizing radiation modeling and assessments p 3165 N92-27242
Micrometeoroids and debris on LDEF p 3192 N92-27243
Detailed examination of LDEF's frame and the A0178 thermal blankets by the meteoroid and debris special investigations group p 3192 N92-27244
LDEF experiment M0003 meteoroid and debris survey p 3192 N92-27245
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
LDEF's map experiment foil perforations yield hypervelocity impact penetration parameters p 3192 N92-27249
Meteoroid and debris special investigation group; status of 3-D crater analysis from binocular imagery p 3192 N92-27251
Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252
Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment p 3192 N92-27253
Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254
Elemental analyses of hypervelocity micro-particle impact sites on interplanetary dust experiment sensor surfaces p 3192 N92-27255
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps p 3193 N92-27256
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257
Interplanetary meteoroid debris in LDEF metal craters p 3193 N92-27258
SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2 p 3193 N92-27259
Further analysis of LDEF FRECOPA micrometeroid remnants p 3193 N92-27260
Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets p 3193 N92-27261
Observation of fullerenes (C60-C70) associated with LDEF crater number 31 p 3073 N92-27262
Asteroidal versus cometary meteoroid impacts on the Long Duration Exposure Facility (LDEF) p 3193 N92-27263
Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces p 3193 N92-27264
Modelling the near-Earth space environment using LDEF data p 3128 N92-27265
The interstellar gas experiment: Analysis in progress p 3145 N92-27266
New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267
Follow up on the crystal growth experiments of the LDEF p 3178 N92-27268
LDEF materials overview p 3068 N92-27269
Databases for LDEF results p 3188 N92-27270
Materials And Processes Technical Information System (MAPTIS) LDEF materials database p 3188 N92-27271
LDEF materials data analysis: Representative examples p 3078 N92-27272
Long Duration Exposure Facility experiment M0003 deintegration observation database p 3078 N92-27273
Thermal Control Surfaces Experiment (TCSE) materials analysis p 3070 N92-27274
Thermal control paints on LDEF: Results of sub-experiment 802-18 p 3078 N92-27275
LDEF thermal control coatings post-flight analysis p 3078 N92-27276
Selected results for LDEF thermal control coatings p 3078 N92-27277
Flouorescence measurements of the thermal control coatings on LDEF experiments S0069 and A0114 p 3078 N92-27278
Atomic oxygen effects on thermal control and mirror coatings: Evaluation of experiment A0034 p 3078 N92-27279
Atomic oxygen effects on LDEF experiment A0171 p 3079 N92-27280
Monte Carlo modeling of atomic oxygen attack of polymers with protective coatings on LDEF p 3079 N92-27281
LDEF polymeric materials: 10 months versus 5.8 years of exposure p 3079 N92-27282
Oxygen isotopes implanted in the LDEF spacecraft p 3165 N92-27284
Silazane to silica p 3079 N92-27285
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288
High-toughness graphite/epoxy composite material experiment p 3070 N92-27289
Space environmental effects on LDEF composites: Leading graphite/epoxy panel, selected trailing edge specimens p 3070 N92-27290
Surface analyses of composites exposed to the space environment on LDEF p 3070 N92-27293
Thermal expansion behavior of LDEF metal matrix composites p 3070 N92-27294
Spectral infrared hemispherical reflectance measurements for LDEF tray clamps p 3170 N92-27295

Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296
Contamination on LDEF sources: Distribution and history p 3073 N92-27297
Contamination measurements on experiment M0003 p 3073 N92-27298
Evaluation of seals, lubricants, and adhesives used on LDEF p 3111 N92-27299
Spacecraft thermal control coatings: Comparison between flight results obtained on LDEF and MIR p 3079 N92-27300
Angular distributions of 5eV atomic oxygen scattered from solid surfaces on the LDEF satellite p 3165 N92-27301
Overview of the systems special investigation --- long duration exposure facility p 3079 N92-27303
New results from FRECOPA analysis --- long duration exposure facility p 3111 N92-27304
Mechanisms flown on LDEF p 3111 N92-27305
Degradation of electro-optic components aboard LDEF --- long duration exposure facility p 3170 N92-27306
Degradation of optical components in a space environment p 3170 N92-27307
Optical characterization of contaminant film --- long duration exposure facility p 3170 N92-27308
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309
LDEF space optics handbook --- long duration exposure facility p 3171 N92-27311
Ruled and holographic experiment (AO 138-5) --- long duration exposure facility p 3107 N92-27312
Holographic data storage crystals for the LDEF --- long duration exposure facility p 3178 N92-27313
Characterization of a space orbited incoherent fiber optic bundle --- long duration exposure facility p 3171 N92-27314
Analysis of space environment effects on active fiber optic links orbited aboard the LDEF --- long duration exposure facility p 3171 N92-27315
Radiation and temperature effects on LDEF fiber optic cable samples --- long duration exposure facility p 3171 N92-27316
Long Duration Exposure Facility (LDEF) low-temperature Heat Pipe Experiment Package (HEPP) flight results p 3106 N92-27317
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment p 3178 N92-27318
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
The effect of the low Earth orbit environment on space solar cells: Results of the advanced photovoltaic experiment (S0014) p 3124 N92-27320
LEO effects on candidate solar cell cover materials p 3124 N92-27321
Final results of the Space Exposed Experiment Developed for Students (SEEDS) P-0004-2 p 3136 N92-27322
Continued results of the seeds in space experiment p 3136 N92-27323
LDEF archival system plan p 3188 N92-27324
Future radiation measurements in low Earth orbit --- long duration exposure facility p 3166 N92-27329

LONG DURATION SPACE FLIGHT
Metabolic energy requirements for space flight [NASA-TM-107933] p 3138 N92-28212

LONG WAVE RADIATION
Kolmogorov spectra in a finite pressure plasma [DE92-621531] p 3174 N92-28044

LONGERONS
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages p 3149 N92-27831

LONGITUDINAL STABILITY
Flight testing of a half-scale remotely piloted vehicle [AD-A248568] p 3048 N92-28123

LORENTZ FORCE
Free electron laser short pulse simulation and two-mode sideband analysis [AD-A246044] p 3108 N92-27659
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
The bearingless electrical machine p 3061 N92-27793
Precise positioning and compliance synthesis for automatic assembly using Lorentz levitation p 3062 N92-27797

LOW ASPECT RATIO
A critical evaluation of a three-dimensional Navier-Stokes method as a tool to calculate transonic flows inside a low-aspect-ratio compressor p 3096 N92-27459

LOW FREQUENCIES
Local kinetic analysis of low frequency electrostatic modes in tokamaks [PPL-110] p 3172 N92-27449

LOW PASS FILTERS
Miniature microwave frequency multiplexers [AD-A246032] p 3090 N92-27656

LOW SPEED WIND TUNNELS
A gust generation method for full configuration aircraft tests in a low speed wind tunnel. Part 1: Design and preliminary experiments [NAL-TR-1115-PT-1] p 3043 N92-28192

LOW TEMPERATURE
Long Duration Exposure Facility (LDEF) low-temperature Heat Pipe Experiment Package (HEPP) flight results p 3106 N92-27317

LUBRICANT TESTS
The relationship between fuel lubricity and diesel injection system wear [AD-A247927] p 3110 N92-27851

LUBRICANTS
Evaluation of seals, lubricants, and adhesives used on LDEF p 3111 N92-27299

LUBRICATION
The relationship between fuel lubricity and diesel injection system wear [AD-A247927] p 3110 N92-27851
Model A: High-temperature tribometer [AD-A249258] p 3107 N92-28217

LUNAR BASES
Design of fast earth-return trajectories from a lunar base [AD-A246553] p 3053 N92-27530
Project UM-HAUL (UnManned Heavy pAyload Unloader and Lander): The design of a reusable lunar lander with an independent cargo unloader [NASA-CR-189971] p 3054 N92-27540

LUNAR OBSERVATORIES
Multi-use lunar telescopes [NASA-TM-107908] p 3189 N92-27651

LUNAR SURFACE
Project UM-HAUL (UnManned Heavy pAyload Unloader and Lander): The design of a reusable lunar lander with an independent cargo unloader [NASA-CR-189971] p 3054 N92-27540

LYMPHOCYTES
Diminishing radiation damage and enhancing immune system recovery: A study [DREO-CR-91-646] p 3137 N92-27702

M

MACH NUMBER
An investigation into the performance characteristics of a solid fuel SCRAMJET propulsion device [AD-A246486] p 3048 N92-27206

MACHINE LEARNING
An evolutionary approach to designing neural networks [AD-A247003] p 3157 N92-27987

MAGELLANIC CLOUDS
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640

MAGNESIUM ALLOYS
Processing, microstructure and superplasticity in Al-Mg-Mn alloys [AD-A246488] p 3073 N92-27207

MAGNETIC BEARINGS
International Symposium on Magnetic Suspension Technology, part 1 [NASA-CP-3152-PT-1] p 3056 N92-27721
Magnetic bearings: A key technology for advanced rocket engines? p 3057 N92-27725
Active magnetic bearings: As applied to centrifugal pumps p 3057 N92-27726
Precision magnetic suspension linear bearing p 3057 N92-27727
Modelling and design for PM/EM magnetic bearings p 3057 N92-27728
Application of narrow band control to reduce vibrations in magnetic bearing systems p 3057 N92-27729
Stability and performance of notch filter control for unbalance response p 3058 N92-27731
A six degree-of-freedom magnetic bearing for microgravity vibration isolation p 3058 N92-27732
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Characterization of superconducting magnetic bearings (dynamic stiffness and damping coefficient in axial direction) p 3059 N92-27737
Feasibility of magnetic bearings for advanced gas turbine engines p 3059 N92-27738
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740
Experimental results in nonlinear compensation of a one degree-of-freedom magnetic suspension p 3060 N92-27742
Control concepts for active magnetic bearings p 3060 N92-27743
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
International Symposium on Magnetic Suspension Technology, part 2 [NASA-CP-3152-PT-2] p 3061 N92-27788
Application of ceramic superconductors in high speed turbines p 3061 N92-27791
The bearingless electrical machine p 3061 N92-27793
Wide gap, permanent magnet biased magnetic bearing system p 3062 N92-27794
Force analysis of magnetic bearings with power-saving controls p 3062 N92-27795
Precise positioning and compliance synthesis for automatic assembly using Lorentz levitation p 3062 N92-27797
Development of a differentially balanced magnetic bearing and control system for use with a flywheel energy storage system p 3062 N92-27798
Design of bearings for rotor systems based on stability p 3063 N92-27799
An evaluation of some strategies for vibration control of flexible rotors p 3063 N92-27800
Space applications of diamagnetic suspensions p 3064 N92-27808
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809

MAGNETIC CIRCUITS
Modelling and design for PM/EM magnetic bearings p 3057 N92-27728
The bearingless electrical machine p 3061 N92-27793

MAGNETIC COILS
Change in the coil distribution of electrodynamic suspension system p 3064 N92-27806
Computation of magnetic suspension of maglev systems using dynamic circuit theory p 3065 N92-27813

MAGNETIC CONTROL
International Symposium on Magnetic Suspension Technology, part 1 [NASA-CP-3152-PT-1] p 3056 N92-27721
Large-gap magnetic suspension systems p 3057 N92-27724
Application of narrow band control to reduce vibrations in magnetic bearing systems p 3057 N92-27729
Dynamics and control of high precision magnetically levitated vibration isolation systems p 3058 N92-27730
A six degree-of-freedom magnetic bearing for microgravity vibration isolation p 3058 N92-27732
Development of a differentially balanced magnetic bearing and control system for use with a flywheel energy storage system p 3062 N92-27798

MAGNETIC EQUATOR
On the consequences of bi-Maxwellian distributions on parallel electric fields [AD-A246206] p 3173 N92-27603

MAGNETIC FIELD CONFIGURATIONS
Attractive and repulsive magnetic suspension systems overview p 3064 N92-27805
Computational methods for stellerator configurations [DE92-011131] p 3174 N92-28057

MAGNETIC FIELDS
Magnetostrictive direct drive motors [NASA-CR-190451] p 3089 N92-27404
Edge effects on forces and magnetic fields produced by a conductor moving past a magnet [DE92-010502] p 3161 N92-27411
Magnetic fields generated by internal ocean seawater motion [AD-A246589] p 3132 N92-27502
Evaluation of method of moments codes: University of Houston junction and numerical electromagnetic code [AD-A247570] p 3083 N92-27565
Levitation of YBa2Cu3O(7-x) superconductor in a variable magnetic field p 3059 N92-27735
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields p 3060 N92-27748
Nonlinear optics in dense frequency narrow supersonic beams [AD-A246647] p 3168 N92-27756
The bearingless electrical machine p 3061 N92-27793
Manipulation and identification of objects by magnetic forces p 3062 N92-27796
VLA, PHOENIX and BATSE observations of an X1 flare [AD-A248461] p 3194 N92-27935

MAGNETIC FLUX
Effect of flux penetration on the load capacity of passive superconducting bearings p 3061 N92-27790
MAGNETIC LEVITATION VEHICLES
International Symposium on Magnetic Suspension Technology, part 1
[NASA-CP-3152-PT-1] p 3056 N92-27721
Attractive and repulsive magnetic suspension systems overview p 3064 N92-27805
Change in the coil distribution of electrodynamic suspension system p 3064 N92-27806
The concept of the mechanically active guideway as a novel approach to maglev p 3064 N92-27807
Battery cars on superconducting magnetically levitated carriers: One commuting solution p 3065 N92-27811
Knolle Magnetrans: A magnetically levitated train system p 3065 N92-27812
Computation of magnetic suspension of maglev systems using dynamic circuit theory p 3065 N92-27813
MAGNETIC MEASUREMENT
Magnetic fields generated by internal ocean seawater motion
[AD-A246589] p 3132 N92-27502
MAGNETIC PROPERTIES
Application of the renormalization group to critical phenomena in magnetic systems
[ISBN-0-315-56216-1] p 3161 N92-27638
MAGNETIC RESONANCE
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-108] p 3175 N92-28196
Effects of kinetic damping on the ion temperature gradient mode in tokamaks
[PPL-105] p 3175 N92-28204
MAGNETIC STORMS
Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594
MAGNETIC SUSPENSION
International Symposium on Magnetic Suspension Technology, part 1
[NASA-CP-3152-PT-1] p 3056 N92-27721
Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722
Professor Jesse W. Beams and the first practical magnetic suspension p 3057 N92-27723
Large-gap magnetic suspension systems p 3057 N92-27724
Precision magnetic suspension linear bearing p 3057 N92-27727
Dynamics and control of high precision magnetically levitated vibration isolation systems p 3058 N92-27730
Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740
Experimental results in nonlinear compensation of a one degree-of-freedom magnetic suspension p 3060 N92-27742
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields p 3060 N92-27746
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747
International Symposium on Magnetic Suspension Technology, part 2
[NASA-CP-3152-PT-2] p 3061 N92-27788
Magnetic suspension using high temperature superconducting cores p 3061 N92-27789
Effect of flux penetration on the load capacity of passive superconducting bearings p 3061 N92-27790
Application of ceramic superconductors in high speed turbines p 3061 N92-27791
Cryogenic test rig with an aerodynamic magnetically levitated carriage p 3052 N92-27792
Wide gap, permanent magnet biased magnetic bearing system p 3062 N92-27794
Force analysis of magnetic bearings with power-saving controls p 3062 N92-27795
Manipulation and identification of objects by magnetic forces p 3062 N92-27796
Development of a differentially balanced magnetic bearing and control system for use with a flywheel energy storage system p 3062 N92-27798
Propulsion simulator for magnetically suspended wind tunnel models p 3052 N92-27801
Present status of the MIT/NASA Langley 6-inch MSBS p 3053 N92-27802
Progress of magnetic suspension and balance systems for wind tunnels in the USSR p 3053 N92-27803
Wind tunnel magnetic Suspension Systems at the University of Southampton, England p 3053 N92-27804
Attractive and repulsive magnetic suspension systems overview p 3064 N92-27805
Change in the coil distribution of electrodynamic suspension system p 3064 N92-27806
Space applications of diamagnetic suspensions p 3064 N92-27808
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809
Computation of magnetic suspension of maglev systems using dynamic circuit theory p 3065 N92-27813
Large-gap magnetic positioning system having advantageous configuration p 3065 N92-27814
Performance of a superconducting large-angle magnetic suspension p 3065 N92-27815
The large-angle magnetic suspension test fixture p 3065 N92-27816
MAGNETO-OPTICS
Magneto-optical studies of ultrathin ferromagnetic films
[DE92-010252] p 3176 N92-27345
MAGNETOHYDRODYNAMIC STABILITY
Plasma Theory and Simulation Group
[AD-A246129] p 3171 N92-27330
Destabilized ion acoustic transit mode and anomalous transport in tokamaks
[PPL-123] p 3172 N92-27447
Stability of long wavelength modes in tokamaks
[PPL-117] p 3172 N92-27448
Stabilizing effect of dissipative trapped electrons on the energetic ion modes
[PPL-121] p 3172 N92-27579
Skin size electromagnetic drift mode and anomalous transport
[PPL-119] p 3172 N92-27580
Electromagnetic microinstability in toroidal plasmas
[PPL-115] p 3173 N92-27582
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-103] p 3173 N92-27648
Anomalous electron thermal diffusivity, anomalous particle pinch, and isotope effect due to the skin size electromagnetic drift mode
[PPL-116] p 3173 N92-27883
Computational methods for stellerator configurations
[DE92-011131] p 3174 N92-28057
Ballooning and drift-Alfven modes in tokamaks
[PPL-104] p 3174 N92-28195
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-108] p 3175 N92-28196
Local kinetic analysis of the ballooning mode in tokamaks
[PPL-111] p 3175 N92-28197
Electromagnetic and kinetic effects on the ion temperature gradient mode
[PPL-113] p 3175 N92-28198
Effects of kinetic damping on the ion temperature gradient mode in tokamaks
[PPL-105] p 3175 N92-28204
Microballooning mode in tokamaks
[PPL-107] p 3175 N92-28205
MAGNETOHYDRODYNAMIC WAVES
The structure of MFD shock waves in a model of two fluids
[DE92-622860] p 3106 N92-28216
MAGNETOMETERS
Permeable prolate spheroid in an external field: Demagnetization and gradiometer performance
[AD-A245932] p 3106 N92-27857
MAGNETOSTATICS
Manipulation and identification of objects by magnetic forces p 3062 N92-27796
MAGNETOSTRICTION
Magnetostrictive direct drive motors
[NASA-CR-190451] p 3089 N92-27404
MAGNETRON SPUTTERING
Research in high dielectric properties of ferroelectric materials
[AD-A246899] p 3177 N92-27985
MAINTENANCE
Flight-determined benefits of integrated flight-propulsion control systems
[NASA-TM-4393] p 3048 N92-27587
Documentation requirements for software maintenance
[AD-A246716] p 3151 N92-28069
MALES
Gender, equity, and job satisfaction
[AD-A246588] p 3139 N92-27501
MAN POWERED AIRCRAFT
Human-powered helicopter: A program for design and construction
[AD-A246821] p 3142 N92-27350
MAN-COMPUTER INTERFACE
Design of a graphical user interface for a multimedia DBMS: Query Management Facility
[AD-A246397] p 3181 N92-27665
Geometric modeling for computer aided design
[NASA-CR-190363] p 3149 N92-27829
Application driven interface generation for EASIE p 3145 N92-27832
Generating the complete control environment interface for EASIE p 3150 N92-27833
Designing a graphical user interface for a bilateral negotiation support system
[AD-A247910] p 3150 N92-27848
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
A teamwork model of pilot aiding: Psychological principles for mission management systems design p 3032 N92-27893
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant p 3032 N92-27895
Parallel knowledge based systems architectures for in-flight mission management p 3034 N92-27904
Implementation and operational experience with a new arrival traffic management system at the Frankfurt ATC-Center p 3034 N92-27905
Advanced user interface capabilities for application on portable computers
[AD-A247295] p 3144 N92-28177
MANAGEMENT
Management of the fleet satellite communications satellite acquisition for the Naval Postgraduate School
[AD-A246969] p 3082 N92-27400
Product assurance planning in an environment of increased need for accountability
[DE92-010850] p 3115 N92-28055
MANAGEMENT INFORMATION SYSTEMS
An expert system for measuring, interpreting, and managing system performance factors for the work information management system
[AD-A246878] p 3182 N92-27824
MANAGEMENT METHODS
Issues in NASA program and project management
[NASA-SP-6101(05)] p 3181 N92-27609
MANAGEMENT PLANNING
Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552
Highlights of total quality management in the Department of Defense: Lessons learned, quality measurements, and innovative practices
[AD-A246167] p 3114 N92-27602
The advanced tactical fighter early, structured, and continuous user-interface process: A system program office/user team-building concept
[AD-A246641] p 3182 N92-27754
Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827
An efficient method for three-dimensional route planning with different strategies and constraints p 3033 N92-27901
Establishing a Department of Defense program management body of knowledge
[AD-A246625] p 3182 N92-27979
A study of the Air Force's exception management process: Its effect on customer service and order processing
[AD-A246627] p 3183 N92-27981
Guidelines for the development of a Project Data Management Plan (PDMP)
[NASA-TM-107935] p 3183 N92-28156
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222
MANAGEMENT SYSTEMS
Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552
Implementation of a configuration management system for a local area network
[AD-A246474] p 3153 N92-27605
An analysis of total quality management in Aeronautical Systems Division
[AD-A246661] p 3114 N92-27760
Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
Airpower planning and battle management training at airbase level p 3031 N92-27889
A teamwork model of pilot aiding: Psychological principles for mission management systems design p 3032 N92-27893

From an automated flight-test management system to a flight-test engineer's workstation p 3035 N92-27907

MANEUVERABILITY
Flight-determined benefits of integrated flight-propulsion control systems
[NASA-TM-4393] p 3048 N92-27587
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870

MANGANESE ALLOYS
Processing, microstructure and superplasticity in Al-Mg-Mn alloys
[AD-A246488] p 3073 N92-27207

MANGANESE ISOTOPES
New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876

MANIFOLDS
Burst diaphragm sequence valve
[AD-D015241] p 3110 N92-27629

MANIFOLDS (MATHEMATICS)
Boundary value problems on S(exp n) for surfaces of constant Gauss curvature
[PB92-134410] p 3158 N92-27909

MANIPULATORS
EVA robotics for Space Station Freedom: Dextrous Manipulator Development (DEMAND)
p 3155 N92-27765

MANUFACTURING
Institute for Mechanical Engineering
[CTN-92-60489] p 3081 N92-27692
Demonstration of manufacturing process for large area, multilayer piezoelectric composites
[AD-A246662] p 3069 N92-27761

MAPPING
Snow and glacier mapping with polarimetric SAR
p 3120 N92-28021
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038
Evaluation of absolute positioning using the Defense Mapping Agency's (GASP) program
[AD-A246818] p 3044 N92-28133

MAPS
Climatic atlas of the Northern Hemisphere seasonal and annual mean sea-level pressures, 1952-1987
[CGCR-90-17] p 3128 N92-27425
Datums, ellipsoids, grids, and grid reference systems
[AD-A247651] p 3118 N92-27554
An efficient method for three-dimensional route planning with different strategies and constraints
p 3033 N92-27901
Dual frequency along-track interferometry
p 3088 N92-28024

MARINE ENVIRONMENTS
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168

MARINE METEOROLOGY
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
CCN spectra measurements as an active tracer of stratocumulus mechanisms --- cloud condensation nuclei
[AD-A246499] p 3129 N92-27668

MARINE TECHNOLOGY
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139

MARITIME SATELLITES
INMARSAT communications system: A systems approach
[AD-A246820] p 3087 N92-28134

MARKETING
Business planning for scientists and engineers
[DE92-010381] p 3188 N92-28042

MARKOV CHAINS
Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661

MARSHLANDS
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016

MASKS
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990

MASS FLOW
Experimental study of cross-stream mixing in a rectangular duct
[NASA-TM-105694] p 3049 N92-27652

MASS SPECTRA
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047

MASS SPECTROMETERS
Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594
A study of the gas-phase chemistry of solid propellant ingredients using CO2 laser heating
[AD-A246510] p 3080 N92-27631

MASS SPECTROSCOPY
Cosmogenic radioisotopes on LDEF surfaces
p 3165 N92-27239
SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2
p 3193 N92-27259
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry
[AD-A248410] p 3072 N92-28009
Kinetics of surface reactions studied by laser desorption with FTMS detection
[AD-A248412] p 3109 N92-28051

MASS TRANSFER
Presentation of a computational code for 3-D compressible flow in complex channels and cavities
p 3098 N92-27475

MASSIVELY PARALLEL PROCESSORS
Massively parallel computing, C++, and hydrocode algorithms
[DE92-006739] p 3154 N92-27748
Adaptive compression of multisensor image data
[AD-A246389] p 3151 N92-28006

MATCHING
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920

MATERIALS SCIENCE
LDEF materials overview p 3068 N92-27269
Materials And Processes Technical Information System (MAPTIS) LDEF materials database
p 3188 N92-27271
IMI: In partnership with industry
[CTN-92-60490] p 3068 N92-27614
Industrial Materials Institute
[CTN-92-60488] p 3068 N92-27650

MATERIALS TESTS
Degradation of optical components in a space environment p 3170 N92-27307
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819

MATHEMATICAL LOGIC
DFQL: A graphical dataflow query language
[AD-A246086] p 3180 N92-27526
Scope ambiguity and inference
[AD-A247448] p 3148 N92-27591

MATHEMATICAL MODELS
Future directions for LDEF ionizing radiation modeling and assessments p 3165 N92-27242
Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets
p 3193 N92-27261
Modelling the near-Earth space environment using LDEF data p 3128 N92-27265
New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267
Theory and application of random fields
[AD-A246958] p 3159 N92-27334
Users manual and modeling improvements for axial turbine design and performance computer code TD2-2
[NASA-CR-189118] p 3035 N92-27376
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382
A computational study of tip leakage flow and losses in a linear turbine cascade p 3095 N92-27453
A mathematical constraint placed upon inter-blade row boundary conditions used in the simulation of multistage turbomachinery flows p 3095 N92-27458
The coherent flamelet model for propulsion applications p 3073 N92-27486
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
Three dimensional calculations of reactive flows within aircraft combustion chambers including some combustion models p 3101 N92-27490
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-91-17] p 3133 N92-27547
A simple example of modeling hybrid systems using bialgebras: Preliminary version
[NASA-CR-190331] p 3157 N92-27557
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559
Chaotic and random responses of ocean structural systems
[AD-A247561] p 3134 N92-27583
Subinertial circulation on the Scotian Shelf observations and models
[ISBN-0-315-56167-X] p 3134 N92-27621
Finite element methods for flow problems
p 3102 N92-27672
Finite element methods for fluids
p 3102 N92-27673
Multidimensional upwind methods for unstructured grids p 3102 N92-27675
Unstructured grid methods for compressible flows
p 3103 N92-27676
Basic concepts on boundary layers
p 3036 N92-27707
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
Modelling and design for PM/EM magnetic bearings
p 3057 N92-27728
Extended H2 synthesis for multiple degree-of-freedom controllers p 3059 N92-27741
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747
Neural networks modeling and control of dynamical systems p 3155 N92-27769
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques
[AD-A246066] p 3135 N92-27786
Modelling solar radiation in the Arctic: An improved method for the subdivision of global radiation
[AD-A246271] p 3194 N92-27818
Hindcast wave information for the great lakes: Lake Ontario
[AD-A246446] p 3135 N92-27820
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853
Investigation of the aeroelastic stability of the AFW wind-tunnel model using CAP-TSD p 3040 N92-27955
Assimilation modeling of coastal transition zone data and continental slope flow fields
[AD-A248692] p 3135 N92-28010
Soil moisture measurements from airborne SAR
p 3120 N92-28020
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050
Research and development of the p-version of the finite element model
[AD-A248582] p 3158 N92-28060
Coherent communications --- fiber optics applications
p 3086 N92-28086
Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144
Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147
An appraisal of cost-effectiveness models used in the Air Force and Navy aircraft engine component improvement programs
[AD-A245910] p 3049 N92-28162
Phase modeling of a parallel scientific code
[DE92-010292] p 3154 N92-28173
Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194
Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210
Reconstruction based on flexible prior models
[DE92-011263] p 3118 N92-28214
The structure of MFD shock waves in a model of two fluids
[DE92-622860] p 3106 N92-28216

Future missions studies: Combining Schatten's solar activity prediction model with a chaotic prediction model
[NASA-CR-189865] p 3194 N92-28221

MATRICES (MATHEMATICS)
The multicomputer toolbox approach to concurrent BLAS and LACs
[DE92-010401] p 3146 N92-27391
Identification of dynamic structures with special attention to damping matrix representation
[AD-A248020] p 3116 N92-27865

MATRIX MATERIALS
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
Life prediction methodologies for composite materials
[AD-A248637] p 3070 N92-28202

MAXIMUM LIKELIHOOD ESTIMATES
Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661
A Cramer-Rao type lower bound for essentially unbiased parameter estimation
[AD-A246666] p 3160 N92-27915
Estimation of oblique electroweak corrections
[DE92-010742] p 3179 N92-28160

MAXWELL EQUATION
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659

MEASURING INSTRUMENTS
Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328

MECHANICAL DRIVES
Magnetostrictive direct drive motors
[NASA-CR-190451] p 3089 N92-27404
Numerical investigations of breather solitons in nonlinear vibratory lattices
[AD-A246524] p 3178 N92-27527

MECHANICAL ENGINEERING
Institute for Mechanical Engineering
[CTN-92-60489] p 3081 N92-27692
AFRAPT Program at Texas A and M University research for advanced aircraft engine structures
[AD-A247040] p 3049 N92-28076

MECHANICAL PROPERTIES
Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247
Evaluation of long-duration exposure to the natural space environment on the mechanical properties of carbon-reinforced epoxy and polyimide composites p 3070 N92-27291
Degradation of optical components in a space environment p 3170 N92-27307
The effect of jet fuel exposure on advanced aerospace composites. Part 1: Thermal and chemical analysis
[AD-A246559] p 3068 N92-27531
The mechanical properties of metal-void composites --- pressurized microvoids
[AD-A246087] p 3069 N92-27749
Dynamic test apparatus for electro-rheological fluids
[AD-D015201] p 3106 N92-27823
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers
[DE92-010449] p 3069 N92-27856
Shape memory effect alloys
[DE92-619932] p 3074 N92-27875
Fabric-stress-deformation relations in granular materials
[AD-A247009] p 3117 N92-28138

MEDICAL SCIENCE
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371

MELTING
Investigation of the rate-controlling mechanism(s) for high temperature creep and the relationship between creep and melting by use of high pressure as a variable
[DE92-011058] p 3074 N92-27416

MEMBRANES
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

MEMORY
Fourth conference on the neurobiology of learning and memory
[AD-A247174] p 3140 N92-27538
Human image understanding
[AD-A247048] p 3140 N92-27825
Reference frames in vision
[AD-A248743] p 3138 N92-27968

MEMORY (COMPUTERS)
An expert system for measuring, interpreting, and managing system performance factors for the work information management system
[AD-A246678] p 3182 N92-27824
Video-text processing by using Motorola 68020 CPU and its environment
[AD-A245775] p 3184 N92-27911
Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144

MENTAL PERFORMANCE
Norms and the perception of events
[AD-A247032] p 3138 N92-27337
Human image understanding
[AD-A247048] p 3140 N92-27825
Causal models in the acquisition and instruction of programming skills
[AD-A248761] p 3141 N92-27969
Comparability of two cognitive performance assessment systems
[AD-A248760] p 3144 N92-28095
Individual differences in adaptive processing in complex learning and cognitive performance
[AD-A248586] p 3142 N92-28179

MERCATOR PROJECTION
Datums, ellipsoids, grids, and grid reference systems
[AD-A247651] p 3118 N92-27554

MESOMETEOROLOGY
Coastally trapped disturbances in the lower atmosphere
[ISBN-0-315-55186-0] p 3129 N92-27622

MESOSCALE PHENOMENA
Modeling and observational studies of mesoscale air-mass boundaries and warm-season convective precipitation
[AD-A247030] p 3128 N92-27336
Coastally trapped disturbances in the lower atmosphere
[ISBN-0-315-55186-0] p 3129 N92-27622

MESOSPHERE
Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696

METABOLISM
Metabolic energy requirements for space flight
[NASA-TM-107933] p 3138 N92-28212

METAL BONDING
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246836] p 3075 N92-28119

METAL COMBUSTION
Multiple-wavelength transmission measurements in rocket motor plumes
[AD-A245999] p 3067 N92-27521

METAL CRYSTALS
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon
[AD-A248958] p 3178 N92-28081

METAL FILMS
Angular distributions of 5eV atomic oxygen scattered from solid surfaces on the LDEF satellite p 3165 N92-27301
Interaction of atomic oxygen with thin film and bulk copper: An XPS, AES, XRD, and profilometer study p 3166 N92-27302
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837
Kinetics of surface reactions studied by laser desorption with FTMS detection
[AD-A248412] p 3109 N92-28051

METAL FOILS
LDEF's map experiment foil perforations yield hypervelocity impact penetration parameters p 3192 N92-27249
The interstellar gas experiment: Analysis in progress p 3145 N92-27266
Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008

METAL HYDRIDES
Tritium measurement technique using in-bed calorimetry
[DE92-010061] p 3079 N92-27363

METAL IONS
Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry
[AD-A248410] p 3072 N92-28009
Active fibres and optical amplifiers p 3086 N92-28089

METAL MATRIX COMPOSITES
Thermal expansion behavior of LDEF metal matrix composites p 3070 N92-27294
The mechanical properties of metal-void composites --- pressurized microvoids
[AD-A246087] p 3069 N92-27749
Advanced materials for turbomachinery. Technical memo number 2: Advanced materials compatibility with storable propellants (monomethyl hydrazine and nitrogen tetroxide)
[AD-A246725] p 3080 N92-28070

METAL PLATES
Shielded metal arc welding consumables for advanced high strength steels
[AD-A247005] p 3075 N92-28136

METAL POWDER
High temperature silicide protective coating slurry
[AD-D015194] p 3076 N92-27491
Environmentally stable metal powders --- gas atomization process
[AD-D015222] p 3074 N92-27619

METAL PROPELLANTS
Multiple-wavelength transmission measurements in rocket motor plumes
[AD-A245999] p 3067 N92-27521

METAL SURFACES
Attitude stability of LDEF: Refinement of results from the silver pinhole camera p 3066 N92-27219
Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296
Environmentally stable metal powders --- gas atomization process
[AD-D015222] p 3074 N92-27619
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon
[AD-A248958] p 3178 N92-28081
Atomic-level structure and dynamics of ordered metal electrodes as probed by infrared spectroscopy and scanning tunneling microscopy
[AD-A246738] p 3164 N92-28105

METAL VAPORS
Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry
[AD-A248410] p 3072 N92-28009

METALS
IMI: In partnership with industry
[CTN-92-60490] p 3068 N92-27614
Industrial Materials Institute
[CTN-92-60488] p 3068 N92-27650
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178

METASTABLE STATE
Proof of the feasibility of coherent and incoherent schemes for pumping a gamma ray laser
[AD-A245372] p 3107 N92-27438

METEORITE COLLISIONS
LDEF experiment M0003 meteoroid and debris survey p 3192 N92-27245

METEORITIC DAMAGE
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252
Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps p 3193 N92-27256
Interplanetary meteoroid debris in LDEF metal craters p 3193 N92-27258
Further analysis of LDEF FRECOPA micrometeroid remnants p 3193 N92-27260
Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets p 3193 N92-27261
Observation of fullerenes (C60-C70) associated with LDEF crater number 31 p 3073 N92-27262
New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267

METEOROID CONCENTRATION
Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets p 3193 N92-27261
New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267

METEOROID HAZARDS
Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets p 3193 N92-27261

METEOROID SHOWERS
Survivability of meteor burst communication under adverse operating conditions
[AD-A248632] p 3085 N92-28065
METEOROIDS
Detailed examination of LDEF's frame and the A0178 thermal blankets by the meteoroid and debris special investigations group p 3192 N92-27244
Meteoroid and debris special investigation group; status of 3-D crater analysis from binocular imagery p 3192 N92-27251
Interplanetary meteoroid debris in LDEF metal craters p 3193 N92-27258
Asteroidal versus cometary meteoroid impacts on the Long Duration Exposure Facility (LDEF) p 3193 N92-27263
New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267
Survivability of meteor burst communication under adverse operating conditions
[AD-A248632] p 3085 N92-28065
METEOROLOGICAL BALLOONS
Small balloon ballistic tracing and behavior anomalies
[AD-A247435] p 3130 N92-27845
METEOROLOGICAL INSTRUMENTS
Meteorological measurement guide
[AD-A247455] p 3130 N92-27859
METEOROLOGICAL PARAMETERS
Momentum transport by cumulus clouds and its parameterization
[ISBN-0-315-54644-1] p 3129 N92-27610
Infrared horizon detection
[AD-A246904] p 3084 N92-27717
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247928] p 3125 N92-27846
Meteorological measurement guide
[AD-A247455] p 3130 N92-27859
METEOROLOGICAL RADAR
An 11-CM full-matrix polarimetric radar for meteorological research
[AD-A246893] p 3082 N92-27506
METHOD OF MOMENTS
Evaluation of method of moments codes: University of Houston junction and numerical electromagnetic code
[AD-A247570] p 3083 N92-27565
Numerical simulation of the function of scientific instrumentation for measuring the speed of electron devices
[AD-A247006] p 3093 N92-28137
METHYL COMPOUNDS
Silazane to silica p 3079 N92-27285
METHYL NITRATE
First, second, and third generation high energy materials from cubane
[AD-A247559] p 3080 N92-27562
METRIC SPACE
Solutions of Einstein's equations having functionally separable metrics
[ISBN-0-315-60751-3] p 3179 N92-27688
MEXICO
Project MEDSAT: The design of a remote sensing platform for malaria research and control
[NASA-CR-190008] p 3055 N92-27541
MICHELSON INTERFEROMETERS
Thermal expansion behavior of LDEF metal matrix composites p 3070 N92-27294
MICROANALYSIS
A study of the gas-phase chemistry of solid propellant ingredients using CO2 laser heating
[AD-A246510] p 3080 N92-27631
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161
MICROBALANCES
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment p 3178 N92-27318
MICROBURSTS (METEOROLOGY)
Experimental evaluation of candidate graphical microburst alert displays
[NASA-CR-189633] p 3047 N92-27424
The modelling of turbulence and downbursts for flight simulators
[ISBN-0-315-59945-6] p 3051 N92-27645
MICROCOMPUTERS
Satellite image display and processing with microcomputers: A proof-of-concept for the Navy Oceanographic Data Distribution System (NODDS)
[AD-A247247] p 3118 N92-27214
A micro computer based procurement system: An application of reverse engineering techniques
[AD-A245956] p 3147 N92-27544
Video-text processing by using Motorola 68020 CPU and its environment
[AD-A245775] p 3184 N92-27911
High speed local area networks p 3086 N92-28087
MICROCRACKS
Space environmental effects on LDEF composites: Leading graphite/epoxy panel, selected trailing edge specimens p 3070 N92-27290
MICROELECTRONICS
FY 1992/1993 biennial RDT and E descriptive summaries: DARPA. Amended
[AD-A247452] p 3218 N92-27593
The para radiation effects current simulator
[AD-A248652] p 3106 N92-27993
MICROGRAVITY APPLICATIONS
Follow up on the crystal growth experiments of the LDEF p 3178 N92-27268
Information systems requirements for the microgravity science and applications program
[NASA-TM-107932] p 3081 N92-28203
MICROMECHANICS
An electrostatically suspended, micro-mechanical rate gyroscope p 3064 N92-27810
MICROMETEORITES
Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247
MICROMETEOROIDS
Micrometeoroids and debris on LDEF p 3192 N92-27243
LDEF experiment M0003 meteoroid and debris survey p 3192 N92-27245
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252
Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment p 3192 N92-27253
Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257
Further analysis of LDEF FRECOPA micrometeroid remnants p 3193 N92-27260
Observation of fullerenes (C60-C70) associated with LDEF crater number 31 p 3073 N92-27262
Modelling the near-Earth space environment using LDEF data p 3128 N92-27265
Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328
MICROPARTICLES
Micrometeoroids and debris on LDEF p 3192 N92-27243
Elemental analyses of hypervelocity micro-particle impact sites on interplanetary dust experiment sensor surfaces p 3192 N92-27255
MICROPOROSITY
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991
[NASA-TM-107546] p 3136 N92-27877
MICROPROCESSORS
End-effector microprocessor p 3145 N92-27776
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005
MICROSTRIP ANTENNAS
Radiation, scattering, and guidance of electromagnetic fields by arbitrarily shaped structures embedded in layered dielectric media
[AD-A248951] p 3085 N92-28066
MICROSTRUCTURE
Processing, microstructure and superplasticity in Al-Mg-Mn alloys
[AD-A246488] p 3073 N92-27207
A study of the microstructural basis for the strength and toughness properties of overaged HSLA-100 steel
[AD-A246955] p 3073 N92-27332
Rheological behavior and microstructure of ceramic particulate/aluminum alloy composites
[NASA-CR-190036] p 3074 N92-27542
Quantum devices
[AD-A247795] p 3177 N92-27705
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819
Development of the microstructure based stochastic life prediction models
[AD-A246447] p 3074 N92-27821
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers
[DE92-010449] p 3069 N92-27856
Theory of semiconducting superlattices and microstructures
[AD-A248681] p 3092 N92-27965
MICROWAVE ANTENNAS
Millimeter-wave quasi-optical arrays
[AD-A248456] p 3093 N92-28141
MICROWAVE CIRCUITS
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656
MICROWAVE FREQUENCIES
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656
High performance YBCO films
[AD-A246802] p 3093 N92-28130
MICROWAVE LANDING SYSTEMS
NAL Dornier 228-200 flight research airplane: Present status and outline of the installed equipment
[NAL-TM-637] p 3045 N92-27429
MICROWAVE SCATTERING
Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559
MICROWAVES
Integrated microwave and infrared precipitation analysis
[AD-A246070] p 3130 N92-27787
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
MILITARY AIR FACILITIES
An exploratory application of neural networks to the sortie generation forecasting problem
[AD-A246626] p 3157 N92-27980
MILITARY AIRCRAFT
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750
MILITARY AVIATION
Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552
MILITARY TECHNOLOGY
STAR 21: Strategic technologies for the Army of the twenty-first century
[REPT-92-8945] p 3160 N92-27423
FY 1992/1993 biennial RDT and E descriptive summaries: DARPA. Amended
[AD-A247452] p 3218 N92-27593
Some advances in US space defense systems
[AD-A246038] p 3160 N92-27658
Advanced baffle materials technology development
[AD-A247935] p 3169 N92-27826
Advances in Fibre-Optic Technology in Communications and for Guidance and Control
[AGARD-LS-184] p 3086 N92-28084
MILKY WAY GALAXY
Topics in galactic dynamics
[ISBN-0-315-47774-1] p 3190 N92-27611
Identification and study of HII regions in the IRAS point source catalog
[ISBN-0-315-61537-0] p 3189 N92-27700
MILLIMETER WAVES
A procedure for obtaining an algebraic approximation to certain integrals
[AD-A245371] p 3157 N92-27437
Development and scientific utilization of the University of California, Santa Barbara free-electron laser
[AD-A246803] p 3109 N92-28131
Millimeter-wave quasi-optical arrays
[AD-A248456] p 3093 N92-28141
MIMO (CONTROL SYSTEMS)
Extended H2 synthesis for multiple degree-of-freedom controllers p 3059 N92-27741
RMS active damping augmentation p 3155 N92-27771
MINIATURIZATION
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656
MIR SPACE STATION
Spacecraft thermal control coatings: Comparison between flight results obtained on LDEF and MIR p 3079 N92-27300
MIRRORS
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309
Glass sample preparation and performance investigations --- solar x-ray imager
[NASA-CR-190399] p 3169 N92-27871
MISALIGNMENT
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies
[NASA-TM-105416] p 3111 N92-27879

MISSILES
Optimal guidance anticipating missile performance
p 3034 N92-27902
MISSION PLANNING
Communication analysis for the expendable explorer spacecraft
[NASA-CR-189273] p 3083 N92-27516
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
Interdiction mission planning and co-ordination during the Gulf conflict 17 January - 27 February 1991
p 3031 N92-27888
Airpower planning and battle management training at airbase level p 3031 N92-27889
Technology and standards for a common air mission planner p 3033 N92-27899
User assembly and servicing system for Space Station, an evolving architecture approach
[NASA-TM-107942] p 3066 N92-28213
MIXING LAYERS (FLUIDS)
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
A study of compressible turbulence
[AD-A247001] p 3105 N92-27986
MIXING LENGTH FLOW THEORY
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade
p 3095 N92-27457
The application of a Navier-Stokes CFD method to civil engine intake flows p 3098 N92-27471
Development of an algebraic turbulence model for analysis of propulsion flows
[NASA-TM-105701] p 3157 N92-27517
MOBILE COMMUNICATION SYSTEMS
Tactical communications network modelling and reliability analysis: An overview
[AD-A245339] p 3084 N92-27855
MOBILITY
Air situation establishment in a mobile multisensor environment p 3031 N92-27891
MODAL RESPONSE
Ground vibration tests of a high fidelity truss for verification of on-orbit damage location techniques
[NASA-TM-107626] p 3115 N92-27375
MODEL REFERENCE ADAPTIVE CONTROL
Application of neural network to adaptive control theory for super-augmented aircraft
[AD-A246596] p 3050 N92-27505
MODELS
Applying the take-grant protection model
[NASA-CR-190439] p 3147 N92-27561
Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722
MODEMS
ALE frequency selection for Navy modems: Analysis
[AD-A247569] p 3083 N92-27564
Design and implementation of a multimedia DBMS: Complex query processing
[AD-A247054] p 3181 N92-27681
MODULATION
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers
[AD-A247574] p 3108 N92-27566
MODULATORS
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
All-optical fiber Faraday rotation current sensor with heterodyne detection technique
[AD-D015226] p 3170 N92-28001
MODULES
Dual modular rocket launcher
[AD-D015228] p 3046 N92-28002
MODULUS OF ELASTICITY
The viscoelastic characterization of polymer materials exposed to the low-Earth orbit environment
p 3079 N92-27283
High-toughness graphite/epoxy composite material experiment p 3070 N92-27289
MOISTURE
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28166
MOISTURE CONTENT
A method to determine moisture profiles from total moisture weight-gain data in polymeric composites
[AD-A247449] p 3077 N92-27550
Monsoon 1990: Preliminary SAR results
p 3120 N92-28022
MOJAVE DESERT (CA)
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert
p 3088 N92-28025
MOLECULAR CHAINS
X ray scattering studies of polyimide thin films from poly(amic acid)s functionalized with a methacrylate
[DE92-010120] p 3075 N92-27364
MOLECULAR CLOUDS
Self-similar spiral structure in astrophysical disks
[ISBN-0-315-61539-7] p 3191 N92-27701
MOLECULAR COLLISIONS
Electron interactions with non-linear polyatomic molecules and their radicals and ions
[AD-A246492] p 3163 N92-27210
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047
MOLECULAR ENERGY LEVELS
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047
MOLECULAR IONS
Hydrogenic ion recombination
[AD-A246886] p 3072 N92-28145
MOLECULAR STRUCTURE
The plasma physics of processing discharges
[AD-A247560] p 3172 N92-27563
MOLECULAR WEIGHT
Investigation of polyisocyanates as second harmonic generating materials
[DE92-010445] p 3089 N92-27366
MOLECULES
Macrocycles containing tin
[AD-A246866] p 3163 N92-27351
Spectroscopy, reaction, and photodissociation in highly vibrationally excited molecules
[DE92-010651] p 3163 N92-27396
MOLYBDENUM ALLOYS
Structural materials for high-heat flux applications
[DE92-010253] p 3073 N92-27346
MOLYBDENUM OXIDES
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry
[AD-A248410] p 3072 N92-28009
MOMENT DISTRIBUTION
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation
p 3039 N92-27944
MOMENTUM
Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
MOMENTUM THEORY
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
MOMENTUM TRANSFER
Momentum transport by cumulus clouds and its parameterization
[ISBN-0-315-54644-1] p 3129 N92-27610
Electromagnetic effects in Saturn's B ring
p 3193 N92-27637
MONGE-AMPERE EQUATION
Boundary value problems on S(exp n) for surfaces of constant Gauss curvature
[PB92-134410] p 3158 N92-27909
MONOMERS
Bislactone curing agents for epoxy resins and polymers obtained therefrom
[AD-D015221] p 3077 N92-27618
MONSOONS
Monsoon 1990: Preliminary SAR results
p 3120 N92-28022
MONTE CARLO METHOD
Monte Carlo modeling of atomic oxygen attack of polymers with protective coatings on LDEF
p 3079 N92-27281
Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485
Numerical simulation of the function of scientific instrumentation for measuring the speed of electron devices
[AD-A247006] p 3093 N92-28137
MONTEREY BAY (CA)
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666
MORPHOLOGY
Atomic oxygen effects on LDEF experiment A0171
p 3079 N92-27280
Surface analyses of composites exposed to the space environment on LDEF p 3070 N92-27293
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Shielded metal arc welding consumables for advanced high strength steels
[AD-A247005] p 3075 N92-28136
MORTALITY
Diminishing radiation damage and enhancing immune system recovery: A study
[DREO-CR-91-646] p 3137 N92-27702
MOTION PERCEPTION
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050
Visual perception of features and objects
[AD-A248578] p 3142 N92-28170
MOTION STABILITY
The large-angle magnetic suspension test fixture
p 3065 N92-27816
MRCA AIRCRAFT
Interdiction mission planning and co-ordination during the Gulf conflict 17 January - 27 February 1991
p 3031 N92-27888
MSM (SEMICONDUCTORS)
High speed interdigital MSM photodiodes
[ISBN-0-315-57980-3] p 3090 N92-27639
MULTIGRID METHODS
Computational techniques for solving the Navier-Stokes equations p 3094 N92-27451
MULTILAYER INSULATION
Process for making semiconductor-on-insulator device interconnects
[AD-D015208] p 3089 N92-27445
MULTIPLEXING
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers
[AD-A247574] p 3108 N92-27566
Subcarrier-multiplexed coherent optical video transmission using direct frequency modulation of semiconductor lasers
[AD-A247618] p 3167 N92-27597
A design, fabrication and test of a precision positioning servo drive for a multiplexed imaging system
[AD-A246507] p 3106 N92-27630
Video-text processing by using Motorola 68020 CPU and its environment
[AD-A245775] p 3184 N92-27911
Optical fiber sensors p 3086 N92-28090
MULTIPLIERS
Space division switches based on semiconductor optical amplifiers
[AD-A247619] p 3176 N92-27598
Space-division optical switches based on semiconductor optical amplifiers
[AD-A247616] p 3167 N92-27608
MULTISENSOR APPLICATIONS
Adaptive compression of multisensor image data
[AD-A248389] p 3151 N92-28006
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
MULTISPECTRAL BAND SCANNERS
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036
MULTIVARIATE STATISTICAL ANALYSIS
An investigation of multivariate adaptive regression splines for modeling and analysis of univariate and semi-multivariate time series systems
[AD-A246155] p 3159 N92-27578
Estimating the reliability of a system on the basis of sample paths
[AD-A248585] p 3115 N92-28171
MUSCULAR FATIGUE
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990

N

NAP-OF-THE-EARTH NAVIGATION
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
NARROWBAND
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520
Application of narrow band control to reduce vibrations in magnetic bearing systems p 3057 N92-27729
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785
Narrowband and broadband envelope cues for aural classification
[AD-A248693] p 3163 N92-28011

NASA PROGRAMS
Research and Technology Objectives and Plans Summary (RTOPS)
[NASA-TM-101862] p 3218 N92-27360
Issues in NASA program and project management
[NASA-SP-6101(05)] p 3181 N92-27609
Doing business with NASA
[NASA-NP-151] p 3182 N92-27843
Guidelines for the development of a Project Data Management Plan (PDMP)
[NASA-TM-107935] p 3183 N92-28156
Johnson Space Center's regenerative life support systems test bed
[NASA-TM-107943] p 3144 N92-28157
Information systems requirements for the microgravity science and applications program
[NASA-TM-107932] p 3081 N92-28203
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research
[NASA-TM-107925] p 3187 N92-28220

NASA SPACE PROGRAMS
Space Station: Contract oversight and performance provisions for major work packages. Briefing report to the Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space and Technology, House of Representatives
[GAO/NSIAD-92-171BR] p 3182 N92-27928
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222

NASTRAN
Engine structures modeling software system: Computer code. User's manual
[NASA-CR-189154] p 3116 N92-27872

NATURAL LANGUAGE (COMPUTERS)
The TRAINS project
[AD-A247447] p 3181 N92-27590
Scope ambiguity and inference
[AD-A247448] p 3148 N92-27591
Natural language processing of captions for retrieving multimedia data
[AD-A247780] p 3184 N92-27860
Knowledge-based natural language understanding: A AAAI-87 survey talk
[AD-A249120] p 3151 N92-28068
The RHET system: A sequence of self-guided tutorials
[AD-A248960] p 3151 N92-28082

NAVIER-STOKES EQUATION
Computational techniques for solving the Navier-Stokes equations p 3094 N92-27451
Turbine internal fluid flow analysis and Stokes' hypothesis p 3095 N92-27455
Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades p 3095 N92-27456
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade p 3095 N92-27457
A critical evaluation of a three-dimensional Navier-Stokes method as a tool to calculate transonic flows inside a low-aspect-ratio compressor p 3096 N92-27459
Navier-Stokes analysis of turbine blade heat transfer and performance p 3097 N92-27468
The application of a Navier-Stokes CFD method to civil engine intake flows p 3098 N92-27471
Three dimensional flow in sharp bends --- ducted flow p 3099 N92-27481
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle p 3100 N92-27482
Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483
Fundamental studies on droplet interactions in dense sprays
[AD-A246918] p 3101 N92-27546
Finite element methods for fluids p 3102 N92-27673
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations p 3103 N92-27677
A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications p 3037 N92-27937
Computations of unsteady flows around airfoil sections by explicit and implicit methods solving the Euler and Navier-Stokes equations p 3039 N92-27948
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957
Steady and transient analysis of flows exhibiting strong viscous/inviscid interaction (Composite RNS procedures)
[AD-A247171] p 3105 N92-28175

NAVIGATION
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898

NAVY
A micro computer based procurement system: An application of reverse engineering techniques
[AD-A245956] p 3147 N92-27544
An information systems architecture analysis for Naval Air Systems Command
[AD-A247787] p 3184 N92-27885

NEGATIVE IONS
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047

NEODYMIUM LASERS
Investigation of polyisocyanates as second harmonic generating materials
[DE92-010445] p 3089 N92-27366
Holmium laser pumped with a neodymium laser
[AD-D015220] p 3108 N92-27617
Large second-harmonic response of C60 thin films
[AD-A248957] p 3092 N92-28080

NETWORK ANALYSIS
National airspace data interchange network analysis
[AD-A247345] p 3044 N92-27217
Four-dimensional interconnect experimental development
[AD-A247287] p 3106 N92-27385
Neural networks modeling and control of dynamical systems p 3155 N92-27769
Tactical communications network modelling and reliability analysis: An overview
[AD-A245339] p 3084 N92-27855
Management of the Space Physics Analysis Network (SPAN)
[NASA-TM-107934] p 3187 N92-28188

NETWORK CONTROL
Application of neural network to adaptive control theory for super-augmented aircraft
[AD-A246596] p 3050 N92-27505
Neural networks modeling and control of dynamical systems p 3155 N92-27769
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
Advanced systems engineering and network planning support
[NASA-CR-189274] p 3182 N92-27972

NEURAL NETS
Four-dimensional interconnect experimental development
[AD-A247287] p 3106 N92-27385
Automated screening of propulsion system test data by neural networks, phase 1
[NASA-CR-184329] p 3066 N92-27403
Application of neural network to adaptive control theory for super-augmented aircraft
[AD-A246596] p 3050 N92-27505
Data compression using artificial neural networks
[AD-A246906] p 3149 N92-27718
Neural networks modeling and control of dynamical systems p 3155 N92-27769
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
An exploratory application of neural networks to the sortie generation forecasting problem
[AD-A246626] p 3157 N92-27980
An evolutionary approach to designing neural networks
[AD-A247003] p 3157 N92-27987
Mathematical and numerical analysis aspects of quasi-neural networks
[AD-A248583] p 3158 N92-28061

NEUROLOGY
Fourth conference on the neurobiology of learning and memory
[AD-A247174] p 3140 N92-27538
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142

NEURONS
The effects of hydrazines on neuronal excitability
[AD-A247103] p 3137 N92-27844

NEUROPHYSIOLOGY
Fourth conference on the neurobiology of learning and memory
[AD-A247174] p 3140 N92-27538
Stress-induced enhancement of the startle reflex
[AD-A247096] p 3140 N92-27839
The effects of hydrazines on neuronal excitability
[AD-A247103] p 3137 N92-27844
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142

NEUROTRANSMITTERS
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

NEUTRAL PARTICLES
The interstellar gas experiment: Analysis in progress p 3145 N92-27266

NEUTRON DIFFRACTION
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869

NEUTRON STARS
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636

NEUTRONS
The neutron-deuteron in hyperspherical formalism
[BONN-IR-91-13] p 3163 N92-27421

NEWTON METHODS
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations p 3039 N92-27945

NICKEL
New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876
The determination of interfacial structure and phase transitions in Al/Cu and Al/Ni interfaces by means of surface extended x ray absorption fine structure
[DE92-009373] p 3074 N92-27913

NICKEL HYDROGEN BATTERIES
Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update
[NASA-TM-105689] p 3067 N92-27878

NIGHT VISION
The influence of subject expectation on visual accommodation in the dark
[AD-A245923] p 3142 N92-28164

NIOBIUM ALLOYS
Structural materials for high-heat flux applications
[DE92-010253] p 3073 N92-27346

NITROGEN ATOMS
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835

NITROGEN COMPOUNDS
First, second, and third generation high energy materials from cubane
[AD-A247559] p 3080 N92-27562

NITROGEN DIOXIDE
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047

NOISE (SOUND)
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247928] p 3125 N92-27846

NOISE INTENSITY
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085
Coherent communications --- fiber optics applications p 3086 N92-28086

NOISE MEASUREMENT
Steady-state acoustical noise measurements in aviation systems
[AD-A247831] p 3162 N92-27924

NOISE POLLUTION
On minimising noise problems caused by passenger lifts in studio centres
[BBC-RD-1992/2] p 3087 N92-28101

NOISE REDUCTION
On minimising noise problems caused by passenger lifts in studio centres
[BBC-RD-1992/2] p 3087 N92-28101

NOISE TEMPERATURE
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181

NOMOGRAPHS
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288

NONDESTRUCTIVE TESTS
A preliminary study on damage detection using piezoelectric film
[AD-A246350] p 3046 N92-28118

NONEQUILIBRIUM FLOW
Nonequilibrium 3D flows of air through inlets p 3100 N92-27487
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488

Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
NONLINEAR EQUATIONS
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations p 3103 N92-27677
Research and development of the p-version of the finite element model
[AD-A248582] p 3158 N92-28060
Nonlinear effects in optical fibers p 3086 N92-28088
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178
NONLINEAR OPTICS
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27716
Nonlinear optics in dense frequency narrow supersonic beams
[AD-A246647] p 3168 N92-27756
NONLINEAR PROGRAMMING
Optimal guidance anticipating missile performance p 3034 N92-27902
NONLINEAR SYSTEMS
Chaotic and random responses of ocean structural systems
[AD-A247561] p 3134 N92-27583
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
Experimental results in nonlinear compensation of a one degree-of-freedom magnetic suspension p 3060 N92-27742
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782
Some basic research problems related to energy
[DE92-011220] p 3072 N92-28043
Nonlinear aspects of shock response in isolated accelerometers
[DE92-010827] p 3107 N92-28054
NONLINEARITY
Numerical investigations of breather solitons in nonlinear vibratory lattices
[AD-A246524] p 3178 N92-27527
An investigation of multivariate adaptive regression splines for modeling and analysis of univariate and semi-multivariate time series systems
[AD-A246155] p 3159 N92-27578
Nonlinear optics in dense frequency narrow supersonic beams
[AD-A246647] p 3168 N92-27756
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems
[NASA-CR-186516] p 3116 N92-27874
Recent applications of linear and nonlinear unsteady aerodynamics for aeroelastic analysis p 3038 N92-27940
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178
Wave-wave interactions in a steady-state stratospheric model, part 2
[CRG-89-6-PT-2] p 3128 N92-28201
NONPARAMETRIC STATISTICS
An investigation of multivariate adaptive regression splines for modeling and analysis of univariate and semi-multivariate time series systems
[AD-A246155] p 3159 N92-27578
NORTHERN HEMISPHERE
Climatic atlas of the Northern Hemisphere seasonal and annual mean sea-level pressures, 1952-1987
[CGCR-90-17] p 3128 N92-27425
NOZZLE DESIGN
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle p 3052 N92-27977
NOZZLE EFFICIENCY
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488
NOZZLE FLOW
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row p 3050 N92-27466
Aerothermodynamics of nozzle flows for advanced hypersonic propulsion systems p 3099 N92-27478
Application of finite element method to hypersonic nozzle flow computations p 3099 N92-27479
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle p 3100 N92-27482
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
NOZZLE GEOMETRY
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
NOZZLE WALLS
Aerothermodynamics of nozzle flows for advanced hypersonic propulsion systems p 3099 N92-27478
NUCLEAR EMULSIONS
Study of the charge and energy distributions of low-energy particles of cosmic radiation in the near-earth orbit by the method of controllable nuclear emulsion
[DE92-620924] p 3195 N92-27494
NUCLEAR PUMPED LASERS
Proof of the feasibility of coherent and incoherent schemes for pumping a gamma ray laser
[AD-A245372] p 3107 N92-27438
NUCLEAR PUMPING
Nuclear-driven flashlamp pumping of the atomic iodine laser
[DE92-010609] p 3107 N92-27393
NUCLEAR RADIATION
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007
NUCLEAR REACTIONS
A photon-phreak digs the LDEF happening p 3164 N92-27226
NUCLEAR STRUCTURE
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
NUCLEATE BOILING
Enhancement of boiling heat transfer in di-electric fluids
[AD-A245962] p 3105 N92-28058
NUCLEATION
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon
[AD-A248958] p 3178 N92-28081
NUCLEI (NUCLEAR PHYSICS)
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
NUCLEONS
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
NUMERICAL ANALYSIS
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
Study of turbulence structure through numerical simulations: The perspective of drag and reduction p 3037 N92-27713
NUMERICAL CONTROL
End-effector microprocessor p 3145 N92-27776
Development and utilization of the University of California, Santa Barbara, free-electron laser
[AD-A248733] p 3109 N92-28124
NUMERICAL WEATHER FORECASTING
The NOGAPS forecast model: A technical description
[AD-A247216] p 3130 N92-27842
NUTRITIONAL REQUIREMENTS
Metabolic energy requirements for space flight
[NASA-TM-107933] p 3138 N92-28212
NYLON (TRADEMARK)
LDEF materials data analysis: Representative examples p 3078 N92-27272

O

O STARS
The incidence and nature of absorption line profile variations among the O stars
[ISBN-0-315-56945-X] p 3189 N92-27684
OBJECT-ORIENTED PROGRAMMING
Massively parallel computing, C++, and hydrocode algorithms
[DE92-006739] p 3154 N92-27748
A formal definition of the object-oriented paradigm for requirements analysis
[AD-A246814] p 3044 N92-28132
OBSERVATORIES
Sudbury Neutrino Observatory
[DE92-011021] p 3194 N92-27415
OBSTACLE AVOIDANCE
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
Comparison of the event-step algorithm to other path planning methods to avoid dynamic 3D obstacles p 3033 N92-27896
OCCUPATION
An educational space seminar to increase American student interest in space careers
[AD-A246565] p 3179 N92-27499
OCEAN BOTTOM
Investigations of the seafloor coupling characteristics of the new ONR OBS and related questions
[AD-A246241] p 3131 N92-27199
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908
OCEAN CURRENTS
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515
Acoustic tomography in the Greenland Sea
[AD-A246574] p 3133 N92-27533
Experiments with a coupled, zonally averaged atmosphere-ocean model: Variability of the thermohaline circulation
[CGCR-90-4] p 3133 N92-27549
Monthly mean sea ice data from the polar ice prediction system, the regional polar ice prediction system (Barents Sea), and the regional polar ice prediction system (Greenland Sea)
[AD-A246145] p 3134 N92-27574
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques
[AD-A246066] p 3135 N92-27786
The ocean's thermohaline circulation: Its stability, variability, and role in climate
[CGCR-91-12] p 3136 N92-28199
OCEAN DYNAMICS
AES/NSERC Industrial Research Chairs (IRC) in climate research
[CGCR-91-9] p 3125 N92-28200
OCEAN MODELS
Current and future trends in Arctic climate research: Can changes of the Arctic sea ice be used as an early indicator of global warming?
[CGCR-91-1] p 3131 N92-27340
NSERC/AES Industrial Research Chairs in climate research, McGill University
[CRG-89-4] p 3124 N92-27343
Review of the physical oceanography of the Labrador Sea
[CGCR-90-12] p 3132 N92-27357
Sensitivity study of a dynamic thermodynamic sea-ice model
[CGCR-91-22] p 3132 N92-27370
Experiments with a coupled, zonally averaged atmosphere-ocean model: Variability of the thermohaline circulation
[CGCR-90-4] p 3133 N92-27549
Monthly mean sea ice data from the polar ice prediction system, the regional polar ice prediction system (Barents Sea), and the regional polar ice prediction system (Greenland Sea)
[AD-A246145] p 3134 N92-27574
Comparison of Gulf Stream forecast model initialization and verification analyses
[AD-A246218] p 3134 N92-27604
The NOGAPS forecast model: A technical description
[AD-A247216] p 3130 N92-27842
The ocean's thermohaline circulation: Its stability, variability, and role in climate
[CGCR-91-12] p 3136 N92-28199
AES/NSERC Industrial Research Chairs (IRC) in climate research
[CGCR-91-9] p 3125 N92-28200
OCEAN SURFACE
Seasonal, monthly, and annual reports of ocean weather stations: Anomaly time series of surface heat budget parameters
[CGCR-91-3] p 3131 N92-27341
Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655
Hindcast wave information for the great lakes: Lake Ontario
[AD-A246446] p 3135 N92-27820
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920
A self-zeroing capacitance probe for water wave measurements
[NASA-RP-1278] p 3135 N92-27930
Dual frequency along-track interferometry p 3088 N92-28024

OCEANOGRAPHIC PARAMETERS
Satellite image display and processing with microcomputers: A proof-of-concept for the Navy Oceanographic Data Distribution System (NODDS)
[AD-A247247] p 3118 N92-27214
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247928] p 3125 N92-27846
OCEANOGRAPHY
Review of the physical oceanography of the Labrador Sea
[CGCR-90-12] p 3132 N92-27357
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515
National oceanographic fleet platform characteristics
[AD-A248452] p 3135 N92-27667
The NOGAPS forecast model: A technical description
[AD-A247216] p 3130 N92-27842
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920
OCEANS
Testing the accuracy of a three-dimensional acoustic coupled mode model
[AD-A247149] p 3162 N92-27369
Magnetic fields generated by internal ocean seawater motion
[AD-A246589] p 3132 N92-27502
Acoustic tomography in the Greenland Sea
[AD-A246574] p 3133 N92-27533
Three-dimensional Ocean Thermal Structure (TOTS) software module software requirements specifications
[AD-A246146] p 3134 N92-27575
Chaotic and random responses of ocean structural systems
[AD-A247561] p 3134 N92-27583
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920
Acoustic sensing of ocean turbulence
[AD-A246752] p 3136 N92-28108
SPAN: Ocean science
[NASA-TM-107939] p 3187 N92-28186
ON-LINE SYSTEMS
EnviroNET: An on-line environment data base for LDEF data p 3188 N92-27222
United States Coast Guard operational information systems: Improving functionality and cross-functionality
[AD-A246900] p 3184 N92-27917
Advanced systems engineering and network planning support
[NASA-CR-189274] p 3182 N92-27972
The AIRSAR image browse system p 3088 N92-28034
A prototype climate information system
[AD-A245352] p 3131 N92-28039
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 14: An analysis of the technical communications practices reported by Israeli and US aerospace engineers and scientists
[NASA-TM-107924] p 3186 N92-28183
ONBOARD DATA PROCESSING
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898
ONBOARD EQUIPMENT
On board planning of 4D-trajectories p 3033 N92-27897
ONE DIMENSIONAL FLOW
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
OPERATING COSTS
Multi-use lunar telescopes
[NASA-TM-107908] p 3189 N92-27651
OPERATING SYSTEMS (COMPUTERS)
Enhancement of image processing capabilities for different environments
[AD-A246956] p 3145 N92-27333
Geometric modeling for computer aided design
[NASA-CR-190363] p 3149 N92-27829
OPERATIONAL AMPLIFIERS
Parasitic free switched capacitor composite operational amplifiers
[AD-A246258] p 3093 N92-28167
OPTICAL COMMUNICATION
STARNET: An integrated services broadband optical network with physical star topology
[AD-A247555] p 3167 N92-27595
Bi-directional optical transmission system for RF electrical energy
[AD-D015224] p 3169 N92-27999
Advances in Fibre-Optic Technology in Communications and for Guidance and Control
[AGARD-LS-184] p 3086 N92-28084
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085
Coherent communications --- fiber optics applications p 3086 N92-28086
High speed local area networks p 3086 N92-28087
Nonlinear effects in optical fibers p 3086 N92-28088
Active fibres and optical amplifiers p 3086 N92-28089
Fiber optic data busses for aircraft p 3048 N92-28093
OPTICAL EQUIPMENT
LDEF space optics handbook --- long duration exposure facility p 3171 N92-27311
Next generation optical instruments and space experiments based on the LDEF thermal control surfaces experiment (S0069) p 3171 N92-27326
Four-dimensional interconnect experimental development
[AD-A247287] p 3106 N92-27385
Subcarrier-multiplexed coherent optical video transmission using direct frequency modulation of semiconductor lasers
[AD-A247618] p 3167 N92-27597
Glass sample preparation and performance investigations --- solar x-ray imager
[NASA-CR-190399] p 3169 N92-27871
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
Optical Terminal Definition for the Future Service Growth (FSG) module of the Advanced Tracking and Data Relay Satellite (ATDRSS)
[NASA-CR-189270] p 3055 N92-28219
OPTICAL FIBERS
Characterization of a space orbited incoherent fiber optic bundle --- long duration exposure facility p 3171 N92-27314
Local area networks with fiber optics
[AD-A247033] p 3166 N92-27338
Design and implementation of a fiber optic token-ring local area network
[AD-A245364] p 3167 N92-27435
Applications of high speed networks
[AD-A246082] p 3153 N92-27525
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007
Coherent communications --- fiber optics applications p 3086 N92-28086
High speed local area networks p 3086 N92-28087
Nonlinear effects in optical fibers p 3086 N92-28088
Active fibres and optical amplifiers p 3086 N92-28089
Optical fiber sensors p 3086 N92-28090
Smart structures: The relevance of fibre optics p 3086 N92-28091
Fiber optic data busses for aircraft p 3048 N92-28093
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[ISBN-0-315-59931-6] p 3117 N92-28158
OPTICAL FILTERS
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27716
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
OPTICAL GYROSCOPES
Fiber-optic gyroscope p 3087 N92-28092
OPTICAL MATERIALS
Degradation of optical components in a space environment p 3170 N92-27307
Optical characterization of contaminant film --- long duration exposure facility p 3170 N92-27308
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309
Diamond as an optical material
[AD-A247628] p 3167 N92-27599
Advanced tactical aircraft early risk reduction phase 1 broad band IR window study
[AD-A246633] p 3046 N92-27982
OPTICAL MEASUREMENT
Optical characterization of contaminant film --- long duration exposure facility p 3170 N92-27308
Next generation optical instruments and space experiments based on the LDEF thermal control surfaces experiment (S0069) p 3171 N92-27326
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A246399] p 3162 N92-27751
OPTICAL MEASURING INSTRUMENTS
Simple-reversible fiber-optic chemical sensors using solvatochromic dyes
[DE92-010441] p 3166 N92-27365
Advanced baffle materials technology development
[AD-A247935] p 3169 N92-27826
Optical fiber sensors p 3086 N92-28090
Fiber-optic gyroscope p 3087 N92-28092
OPTICAL PATHS
Bi-directional optical transmission system for RF electrical energy
[AD-D015224] p 3169 N92-27999
OPTICAL POLARIZATION
A comparison of the measured and modelled effects of brewster angle anisotropies upon pulsed XeCl excimer laser output
[ISBN-0-315-49569-3] p 3109 N92-27698
OPTICAL PROPERTIES
LDEF microenvironments, observed and predicted p 3066 N92-27220
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659
Infrared horizon detection
[AD-A246904] p 3084 N92-27717
Silicon-on-insulator photonics
[AD-A247957] p 3091 N92-27847
OPTICAL PUMPING
Active fibres and optical amplifiers p 3086 N92-28089
OPTICAL RADAR
Laboratory measurements of the transmission and scattering of laser beams in optically dense clouds
[ISBN-0-315-58085-2] p 3108 N92-27647
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
The design, development, and test of balloonborne and groundbased lidar systems. Volume 2: Flight test of Atmospheric Balloon Lidar Experiment, ABLE 2
[AD-A246727] p 3087 N92-28103
OPTICAL TRANSITION
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A246399] p 3162 N92-27751
OPTICAL WAVEGUIDES
Theory of multilayer dielectric planar waveguides and its applications
[ISBN-0-315-49255-4] p 3168 N92-27625
Silicon-on-insulator photonics
[AD-A247957] p 3091 N92-27847
OPTIMAL CONTROL
Control concepts for active magnetic bearings p 3060 N92-27743
OPTIMIZATION
Framework optimization using stochastic gradient process
[ETN-92-90828] p 3159 N92-27406
ORBIT CALCULATION
NAVSPASUR sensor performance study
[AD-A246592] p 3082 N92-27503
ORBITAL ASSEMBLY
Automation and Robotics for Space-Based Systems, 1991
[NASA-CP-10098] p 3154 N92-27763
A space crane concept for performing on-orbit assembly p 3155 N92-27772
Analysis and testing of a space crane articulating joint testbed p 3156 N92-27773
Automated assembly of large space structures p 3156 N92-27774
Development of a machine vision guidance system for automated assembly of space structures p 3156 N92-27775
Panel installation development in Automated Structures Assembly Lab p 3156 N92-27777
Executive system software design and expert system implementation p 3152 N92-27778
Future work in automated assembly of large space structures p 3156 N92-27779
Development of a truss joint for robotic assembly of space structures
[NASA-TP-3214] p 3117 N92-27974
User assembly and servicing system for Space Station, an evolving architecture approach
[NASA-TM-107942] p 3086 N92-28213
ORBITAL LIFETIME
Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254
ORBITAL MANEUVERS
Performance analysis of non-coplanar synergetic maneuvers
[AD-A246576] p 3054 N92-27534

ORBITAL SERVICING
User assembly and servicing system for Space Station, an evolving architecture approach
[NASA-TM-107942] p 3066 N92-28213
ORGANIC SEMICONDUCTORS
Scanning tunneling microscopy of the organic semiconductor ((eta-C5Me5) 2Ru(1,4-(2(2))-cyclophane)) (TCNQ)4
[AD-A246848] p 3093 N92-28121
ORGANIZATIONS
Improved classified material control through the application of a database management system
[AD-A245376] p 3180 N92-27440
Highlights of total quality management in the Department of Defense: Lessons learned, quality measurements, and innovative practices
[AD-A246167] p 3114 N92-27602
An analysis of total quality management in Aeronautical Systems Division
[AD-A246661] p 3114 N92-27760
Conference on Combined Effects: Radiation, Microg ravity, Trauma, and other Factors
[AD-A247799] p 3065 N92-27862
ORTHONORMAL FUNCTIONS
A procedure for obtaining an algebraic approximation to certain integrals
[AD-A245371] p 3157 N92-27437
OSCILLATING FLOW
Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674
Comparison of Euler and full potential methods for unsteady transonic flow calculations
p 3038 N92-27943
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957
An investigation of the information propagation and entropy transport aspects of Stirling machine numerical simulation
[NASA-CR-189143] p 3105 N92-27975
OSCILLATIONS
Experimental investigation of the unsteady pressure field around an oscillating blade
[MITT-90-01] p 3094 N92-27407
Comparison of Euler and full potential methods for unsteady transonic flow calculations
p 3038 N92-27943
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations
p 3039 N92-27945
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream
p 3039 N92-27946
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
p 3041 N92-27958
Transonic wind tunnel investigation of limit cycle oscillations on fighter type wings p 3041 N92-27959
A review of scale effects on surfaces in unsteady motion p 3042 N92-27962
Mathematical and numerical analysis aspects of quasi-neural networks
[AD-A248583] p 3158 N92-28061
Amplification and damping of synchrotron oscillations via a parametric process
[DE92-010748] p 3166 N92-28174
OSCILLATORS
Numerical investigations of breather solitons in nonlinear vibratory lattices
[AD-A246524] p 3178 N92-27527
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181
OUTGASSING
Atomic oxygen effects on thermal control and mirror coatings: Evaluation of experiment A0034
p 3078 N92-27279
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288
Optical characterization of contaminant film — long duration exposure facility p 3170 N92-27308
OXIDATION
High temperature silicide protective coating slurry
[AD-D015194] p 3076 N92-27491
OXIDES
Finite element analysis of monolithic solid oxide fuel cells
[DE92-010515] p 3123 N92-27392
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869
OXIDIZERS
High energy explosive yield enhancer using microencapsulation
[AD-D015195] p 3080 N92-27492
OXYGEN
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C
[AD-A247880] p 3071 N92-27514
Propulsion systems using in situ propellants for a Mars ascent vehicle
[NASA-TM-105741] p 3067 N92-27654
Inspired gas composition influences recovery from experimental venous air embolism
[AD-A247004] p 3138 N92-28135
OXYGEN ATOMS
LDEF microenvironments, observed and predicted
p 3066 N92-27220
Thermal control paints on LDEF: Results of sub-experiment 802-18 p 3078 N92-27275
Flouorescence measurements of the thermal control coatings on LDEF experiments S0069 and A0114
p 3078 N92-27278
Atomic oxygen effects on thermal control and mirror coatings: Evaluation of experiment A0034
p 3078 N92-27279
Atomic oxygen effects on LDEF experiment A0171
p 3079 N92-27280
Monte Carlo modeling of atomic oxygen attack of polymers with protective coatings on LDEF
p 3079 N92-27281
LDEF polymeric materials: 10 months versus 5.8 years of exposure p 3079 N92-27282
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288
Spectral infrared hemispherical reflectance measurements for LDEF tray clamps
p 3170 N92-27295
Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296
Spacecraft thermal control coatings: Comparison between flight results obtained on LDEF and MIR
p 3079 N92-27300
Angular distributions of 5eV atomic oxygen scattered from solid surfaces on the LDEF satellite
p 3165 N92-27301
Interaction of atomic oxygen with thin film and bulk copper: An XPS, AES, XRD, and profilometer study
p 3166 N92-27302
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869
OXYGEN ISOTOPES
Oxygen isotopes implanted in the LDEF spacecraft
p 3165 N92-27284
Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region
[AD-A248612] p 3072 N92-28064
OXYNITRIDES
Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology
[AD-A246989] p 3089 N92-27401
OZONE DEPLETION
Sensitivity of global warming potentials to the assumed background atmosphere
[DE92-011072] p 3124 N92-27417

P

PACIFIC OCEAN
Seasonal, monthly, and annual reports of ocean weather stations: Anomaly time series of surface heat budget parameters
[CGCR-91-3] p 3131 N92-27341
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515
PAINTS
Thermal control paints on LDEF: Results of sub-experiment 802-18 p 3078 N92-27275
LDEF thermal control coatings post-flight analysis
p 3078 N92-27276
Selected results for LDEF thermal control coatings
p 3078 N92-27277
Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296
High-solids and 100-percent solids coatings: A state-of-the-art investigation
[AD-A247557] p 3076 N92-27539
PALEOCLIMATOLOGY
Review of climatic fluctuations on the century timescale
[CGCR-89-7] p 3124 N92-27426
PANELS
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Evaluation of long-duration exposure to the natural space environment on the mechanical properties of carbon-reinforced epoxy and polyimide composites
p 3070 N92-27291
Surface analyses of composites exposed to the space environment on LDEF p 3070 N92-27293
Panel installation development in Automated Structures Assembly Lab p 3156 N92-27777
Determination of minimum adherend thickness for climbing drum and floating roller adhesive tests
[AD-A248883] p 3111 N92-27996
PARABOLIC REFLECTORS
Mid-range UV communications — ultraviolet radiation
[AD-D015213] p 3083 N92-27615
PARALLEL COMPUTERS
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems
[NASA-CR-186516] p 3116 N92-27874
PARALLEL PROCESSING (COMPUTERS)
Application of neural network to adaptive control theory for super-augmented aircraft
[AD-A246596] p 3050 N92-27505
Massively parallel computing, C++, and hydrocode algorithms
[DE92-006739] p 3154 N92-27748
Distributed ray casting for high-speed volume rendering
[AD-A248167] p 3150 N92-27868
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems
[NASA-CR-186516] p 3116 N92-27874
ICAAS piloted simulation evaluation
p 3034 N92-27906
Implementation of parallel algorithms
[AD-A248759] p 3150 N92-27995
Adaptive compression of multisensor image data
[AD-A248389] p 3151 N92-28006
Phase modeling of a parallel scientific code
[DE92-010292] p 3154 N92-28173
PARALLEL PROGRAMMING
Implementation of parallel algorithms
[AD-A248759] p 3150 N92-27995
PARAMETER IDENTIFICATION
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
A Cramer-Rao type lower bound for essentially unbiased parameter estimation
[AD-A246666] p 3160 N92-27915
Comparison of unconstrained and constrained calibration methods
[AD-A246941] p 3111 N92-28074
PARAMETERIZATION
Momentum transport by cumulus clouds and its parameterization
[ISBN-0-315-54644-1] p 3129 N92-27610
The para radiation effects current simulator
[AD-A248652] p 3106 N92-27993
Conditions for the applicability of the regenerative method
[AD-A248598] p 3160 N92-28182
PARASITIC DISEASES
Project MEDSAT: The design of a remote sensing platform for malaria research and control
[NASA-CR-190008] p 3055 N92-27541
PARKING ORBITS
Design of fast earth-return trajectories from a lunar base
[AD-A246553] p 3053 N92-27530
PARSING ALGORITHMS
Natural language processing of captions for retrieving multimedia data
[AD-A247780] p 3184 N92-27860
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163
PARTIAL DIFFERENTIAL EQUATIONS
PDES Application Protocol Suite for Composites (PAS-C): State-Of-The-Art (SOTA) assessment for the PAS-C program
[AD-A247921] p 3069 N92-27849
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178
PARTICLE ACCELERATORS
Hypervelocity impact facility for simulating materials exposure to impact by space debris
p 3192 N92-27250

Simulation of tail distributions in electron-positron circular colliders
[DE92-010743] p 3166 N92-27413
PARTICLE COLLISIONS
Bose-Einstein correlations in proton-antiproton collisions at square root of s equals 200 to 900 GeV
[ISBN-0-315-50129-4] p 3164 N92-27691
PARTICLE ENERGY
To the primary results of experiments in cosmic radiation particle investigation in the energy range E(greater than equals)2 TeV at the KOSMOS-1713 satellite with the SOKOL-2 equipment
[DE92-620935] p 3195 N92-27495
PARTICLE INTERACTIONS
Electron interactions with non-linear polyatomic molecules and their radicals and ions
[AD-A246492] p 3163 N92-27210
HippoDraw and Hippoplotamus
[DE92-010744] p 3146 N92-27414
Sudbury Neutrino Observatory
[DE92-011021] p 3194 N92-27415
The neutron-deuteron in hyperspherical formalism
[BONN-IR-91-13] p 3163 N92-27421
PARTICLE PRECIPITATION
A study of the microstructural basis for the strength and toughness properties of overaged HSLA-100 steel
[AD-A246955] p 3073 N92-27332
PARTICLE SIZE DISTRIBUTION
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655
PARTICLE SPIN
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
PARTICLE THEORY
Plasma Theory and Simulation Group
[AD-A246129] p 3171 N92-27330
PARTICLE TRAJECTORIES
Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328
PARTICLES
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
PASCAL (PROGRAMMING LANGUAGE)
Pascal software for CO2-Laserradar ranging with a HP9000 computer
[AD-A245383] p 3108 N92-27443
PASSENGERS
On minimising noise problems caused by passenger lifts in studio centres
[BBC-RD-1992/2] p 3087 N92-28101
PASSIVITY
Passivation and gating of GaAs and Si surfaces using pseudomorphic structures
[AD-A246990] p 3176 N92-27402
PATTERN RECOGNITION
Investigation of dynamic algorithms for pattern recognition identified in cerebral cortex
[AD-A247860] p 3139 N92-27512
Classification of SAR ship images with the aid of a syntactic pattern recognition algorithm
[DREO-TN-91-10] p 3084 N92-27695
Manipulation and identification of objects by magnetic forces p 3062 N92-27796
PET studies of components of high-level vision
[AD-A246449] p 3140 N92-27822
Human image understanding
[AD-A247048] p 3140 N92-27825
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142
PAYLOADS
Retrievable payload carrier. Next generation Long Duration Exposure Facility: Update 1992 p 3066 N92-27325
Project UM-HAUL (UnManned Heavy pAyload Unloader and Lander): The design of a reusable lunar lander with an independent cargo unloader
[NASA-CR-189971] p 3054 N92-27540
Spacecraft design project multipurpose satellite bus MPS
[NASA-CR-190009] p 3055 N92-27555
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles p 3031 N92-27890
Project MAKS air-launched spaceplane p 3053 N92-27934
PEEK
Characterization of powder coated thermoplastic composite
[AD-A247230] p 3068 N92-27383
Residual thermal stresses in graphite/PEEK (APC-2) laminates
[AD-A247450] p 3077 N92-27592
PEGASUS AIR-LAUNCHED BOOSTER
Project MEDSAT: The design of a remote sensing platform for malaria research and control
[NASA-CR-190008] p 3055 N92-27541
PENETRATION
LDEF's map experiment foil perforations yield hypervelocity impact penetration parameters p 3192 N92-27249
PERCEPTION
Norms and the perception of events
[AD-A247032] p 3138 N92-27337
Gender, equity, and job satisfaction
[AD-A246588] p 3139 N92-27501
Visual attention and perception in three-dimensional space
[AD-A247823] p 3141 N92-27910
Visual processing in texture segregation
[AD-A247173] p 3142 N92-28176
PERCEPTUAL ERRORS
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916
PERCHLORATES
First, second, and third generation high energy materials from cubane
[AD-A247559] p 3080 N92-27562
PERCHLORIC ACID
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120
PERFORMANCE PREDICTION
Users manual and modeling improvements for axial turbine design and performance computer code TD2-2
[NASA-CR-189118] p 3035 N92-27376
Attentional demands and effects of extended practice in a one-finger key-pressing task
[AD-A245384] p 3138 N92-27444
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
The use of electrical transmission line theory to predict the performance of spacecraft radiators
[AD-A247786] p 3091 N92-27861
Glass sample preparation and performance investigations --- solar x-ray imager
[NASA-CR-190399] p 3169 N92-27871
PERFORMANCE TESTS
Degradation of optical components in a space environment p 3170 N92-27307
Effects of long term space environment exposure on optical substrates and coatings (S0050-2) p 3170 N92-27310
Characterization of a space orbited incoherent fiber optic bundle --- long duration exposure facility p 3171 N92-27314
Explosives simulants
[DE92-011074] p 3080 N92-27418
Application of S1BYL2 to the AGARD WG18 compressor test cases p 3094 N92-27452
Design of digital signal processing algorithms for enhancing the measurements of ultra-fast electromagnetic transients
[AD-A246269] p 3148 N92-27663
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836
The use of electrical transmission line theory to predict the performance of spacecraft radiators
[AD-A247786] p 3091 N92-27861
JTIDS electromagnetic compatibility in the 960-1215 MHz band
[AD-A247834] p 3085 N92-27864
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update
[NASA-TM-105689] p 3067 N92-27878
Form error models of the NIST algorithm testing system
[PB92-172014] p 3150 N92-27923
Sound attenuation characteristics of the DH-133A helmet
[AD-A248351] p 3143 N92-27991
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085
PERIODIC VARIATIONS
The ocean's thermohaline circulation: Its stability, variability, and role in climate
[CGCR-91-12] p 3136 N92-28199
PERIPHERAL CIRCULATION
Arterio-venous anastomoses and thermoregulation
[AD-A245385] p 3137 N92-27361
PERMANENT MAGNETS
Edge effects on forces and magnetic fields produced by a conductor moving past a magnet
[DE92-010502] p 3161 N92-27411
Modelling and design for PM/EM magnetic bearings p 3057 N92-27726
Effect of flux penetration on the load capacity of passive superconducting bearings p 3061 N92-27790
Application of ceramic superconductors in high speed turbines p 3061 N92-27791
Wide gap, permanent magnet biased magnetic bearing system p 3062 N92-27794
Large-gap magnetic positioning system having advantageous configuration p 3065 N92-27814
The large-angle magnetic suspension test fixture p 3065 N92-27816
PERMEABILITY
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C
[AD-A247880] p 3071 N92-27514
PERSONAL COMPUTERS
Advanced user interface capabilities for application on portable computers
[AD-A247295] p 3144 N92-28177
PERSONNEL
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750
An analysis of total quality management in Aeronautical Systems Division
[AD-A246661] p 3114 N92-27760
Management of the Space Physics Analysis Network (SPAN)
[NASA-TM-107934] p 3187 N92-28188
PERSONNEL MANAGEMENT
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518
Profile of an effective engineering manager
[AD-A246525] p 3180 N92-27528
PERTURBATION
Attitude stability of LDEF: Refinement of results from the silver pinhole camera p 3066 N92-27219
A boundary integral formulation for unsteady transonic potential flows p 3038 N92-27942
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream p 3039 N92-27946
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949
Transonic aeroelastic calculations in both the time and frequency domains p 3040 N92-27950
Computation of flutter boundaries in the time and frequency domain p 3040 N92-27952
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow p 3040 N92-27953
Direct coupling of fluid structure in transonic aeroelasticity p 3040 N92-27954
Investigation of the aeroelastic stability of the AFW wind-tunnel model using CAP-TSD p 3040 N92-27955
PERTURBATION THEORY
Perturbation theory in light-cone quantization
[DE92-011076] p 3167 N92-27419
Gradient estimation for ratios
[AD-A248453] p 3160 N92-28140
PHASE CONJUGATION
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27716
Nonlinear optics in dense frequency narrow supersonic beams
[AD-A246647] p 3168 N92-27756
PHASE MATCHING
Natural language processing of captions for retrieving multimedia data
[AD-A247780] p 3184 N92-27860
PHASE SHIFT
An investigation of the information propagation and entropy transport aspects of Stirling machine numerical simulation
[NASA-CR-189143] p 3105 N92-27975
PHASE SHIFT KEYING
Minimum polarization modulation: A highly bandwidth efficient coherent optical modulation scheme
[AD-A247556] p 3167 N92-27596
PHASE TRANSFORMATIONS
Nanophase materials assembled from clusters
[DE92-010508] p 3076 N92-27412

The determination of interfacial structure and phase transitions in Al/Cu and Al/Ni interfaces by means of surface extended x ray absorption fine structure
[DE92-009373] p 3074 N92-27913
Phase modeling of a parallel scientific code
[DE92-010292] p 3154 N92-28173

PHENOLS
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer
[AD-A248164] p 3077 N92-27867

PHOSPHATES
Precomplexation and activation of carboxylate and phosphate esters
[AD-A247778] p 3077 N92-27704

PHOSPHAZENE
Synthesis and characterization of new poly(alkyl/arylphosphazenes)
[AD-A245380] p 3076 N92-27442

PHOSPHORIC ACID
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

PHOTODIODES
High speed interdigital MSM photodiodes
[ISBN-0-315-57980-3] p 3090 N92-27639

PHOTODISSOCIATION
Spectroscopy, reaction, and photodissociation in highly vibrationally excited molecules
[DE92-010651] p 3163 N92-27396

PHOTOELECTRON SPECTROSCOPY
Interaction of atomic oxygen with thin film and bulk copper: An XPS, AES, XRD, and profilometer study
p 3166 N92-27302
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047
Spectroscopy and reactions of hydrazoic acid on silicon single crystal surfaces. (2). HN3 and DN3 on Si (100)
[AD-A247047] p 3177 N92-28077
An XPS study of the formation of thin Pt and Ir silicide overlayers on Si (100) 2 x 1 surfaces
[AD-A245929] p 3178 N92-28165

PHOTOGRAPHS
Long Duration Exposure Facility experiment M0003 deintegration observation database
p 3078 N92-27273
PET studies of components of high-level vision
[AD-A246449] p 3140 N92-27822

PHOTOMETERS
Heterostructure device useable as a far infrared photodetector — semiconductor devices
[AD-D015217] p 3168 N92-27616

PHOTOMETRY
Visual photometric experiment data processing system
[AD-A248657] p 3044 N92-27964

PHOTOMICROGRAPHS
Long Duration Exposure Facility experiment M0003 deintegration observation database
p 3078 N92-27273

PHOTOMULTIPLIER TUBES
Sudbury Neutrino Observatory
[DE92-011021] p 3194 N92-27415

PHOTONICS
Silicon-on-insulator photonics
[AD-A247957] p 3091 N92-27847

PHOTONS
Mid-range UV communications — ultraviolet radiation
[AD-D015213] p 3083 N92-27615

PHOTOSPHERE
Identification of driver gas-associated Bz events and prediction of their orientation
[AD-A248480] p 3194 N92-28059

PHYSICAL EXERCISE
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990

PHYSICAL OPTICS
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920

PHYSICAL PROPERTIES
The mechanical properties of metal-void composites — pressurized microvoids
[AD-A246087] p 3069 N92-27749

PHYTOTRONS
Johnson Space Center's regenerative life support systems test bed
[NASA-TM-107943] p 3144 N92-28157

PICOSECOND PULSES
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27716
Transport in ultra-dense plasmas produced by a picosecond laser pulse
[AD-A247827] p 3174 N92-27921

PIEZOELECTRIC CERAMICS
Development of an active damping system to aid in the attitude control of flexible spacecraft
[AD-A246248] p 3050 N92-27200

PIEZOELECTRICITY
Demonstration of manufacturing process for large area, multilayer piezoelectric composites
[AD-A246662] p 3069 N92-27761
A preliminary study on damage detection using piezoelectric film
[AD-A246350] p 3046 N92-28118

PILOT ERROR
A meta-analysis of pilot selection tests: Success and performance in pilot training
[AD-A246623] p 3140 N92-27537

PILOT PERFORMANCE
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094

PILOT SELECTION
A meta-analysis of pilot selection tests: Success and performance in pilot training
[AD-A246623] p 3140 N92-27537

PILOT TRAINING
Experimental evaluation of candidate graphical microburst alert displays
[NASA-CR-189633] p 3047 N92-27424
A meta-analysis of pilot selection tests: Success and performance in pilot training
[AD-A246623] p 3140 N92-27537
The modelling of turbulence and downbursts for flight simulators
[ISBN-0-315-59945-6] p 3051 N92-27645
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836

PINCH EFFECT
Anomalous electron thermal diffusivity, anomalous particle pinch, and isotope effect due to the skin size electromagnetic drift mode
[PPL-116] p 3173 N92-27883

PINHOLE CAMERAS
Attitude stability of LDEF: Refinement of results from the silver pinhole camera p 3066 N92-27219

PIPE FLOW
An experimental study of hypersonic flow development in a pipe
[UTIAS-TN-275] p 3103 N92-27683

PIPELINING (COMPUTERS)
Integrated optical pipelined polynomial processors
[AD-A248573] p 3092 N92-27992

PIPES (TUBES)
LDEF materials data analysis: Representative examples p 3078 N92-27272
Dual modular rocket launcher
[AD-D015228] p 3046 N92-28002
Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318
[DE92-009408] p 3117 N92-28041

PITCH (INCLINATION)
Pitch-heave dynamics models for an air cushion vehicle
[ISBN-0-315-51095-1] p 3036 N92-27624

PITUITARY HORMONES
Stress-induced enhancement of the startle reflex
[AD-A247096] p 3140 N92-27839

PIXELS
Monolithic integration of semiconductor and superconductor components
[AD-A248952] p 3092 N92-28067

PLANE STRAIN
Adiabatic shear bands in simple and dipolar viscoplastic materials
[AD-A246055] p 3077 N92-27545

PLANETARY SURFACES
Autonomous planetary rover
[NASA-CR-190465] p 3173 N92-27866

PLANETARY WAVES
Wave-wave interactions in a steady-state stratospheric model, part 1
[CRG-89-5-PT-1] p 3126 N92-27355
Wave-wave interactions in a steady-state stratospheric model, part 2
[CRG-89-6-PT-2] p 3128 N92-28201

PLANNING
The TRAINS project
[AD-A247447] p 3181 N92-27590
Search route planning p 3033 N92-27900
Business planning for scientists and engineers
[DE92-010381] p 3188 N92-28042
Product assurance planning in an environment of increased need for accountability
[DE92-010850] p 3115 N92-28055

PLASMA CHEMISTRY
The plasma physics of processing discharges
[AD-A247560] p 3172 N92-27563

PLASMA CONTROL
Operation path method for ignition criterion in a D-T tokamak reactor
[PPL-122] p 3174 N92-28193
Ballooning and drift-Alfven modes in tokamaks
[PPL-104] p 3174 N92-28195
Local kinetic analysis of the ballooning mode in tokamaks
[PPL-111] p 3175 N92-28197
Microballooning mode in tokamaks
[PPL-107] p 3175 N92-28205

PLASMA CURRENTS
Physics and diagnostics of laser ablation plume propagation for high-(Tc) superconductor film growth
[DE92-009386] p 3171 N92-27362
Tokamak profiles based on models for the anomalous electron thermal diffusivity
[PPL-125] p 3171 N92-27446

PLASMA DIFFUSION
Transport in ultra-dense plasmas produced by a picosecond laser pulse
[AD-A247827] p 3174 N92-27921

PLASMA EQUILIBRIUM
Computational methods for stellerator configurations
[DE92-011131] p 3174 N92-28057

PLASMA HEATING
Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194

PLASMA INTERACTIONS
Activities, accomplishments and research progress of the Center for Theoretical Geoplasma Physics, Center for Space Research, Massachusetts Inst. of Technology
[AD-A248572] p 3127 N92-27963

PLASMA LAYERS
Transport in ultra-dense plasmas produced by a picosecond laser pulse
[AD-A247827] p 3174 N92-27921

PLASMA PHYSICS
Plasma Theory and Simulation Group
[AD-A246129] p 3171 N92-27330
Development of a Ge/GaAs HMT technology based on plasma enhanced chemical vapor deposition
[AD-A246991] p 3176 N92-27381
The plasma physics of processing discharges
[AD-A247560] p 3172 N92-27563
Activities, accomplishments and research progress of the Center for Theoretical Geoplasma Physics, Center for Space Research, Massachusetts Inst. of Technology
[AD-A248572] p 3127 N92-27963
The structure of MFD shock waves in a model of two fluids
[DE92-622860] p 3106 N92-28216

PLASMA SPRAYING
Thermally sprayed coating systems for surface protection and clearance control applications in aero engines
[PNR-90802] p 3048 N92-27422

PLASMA TEMPERATURE
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640

PLASMA WAVES
Skin size electromagnetic drift mode and anomalous transport
[PPL-119] p 3172 N92-27580
Ballooning and drift-Alfven modes in tokamaks
[PPL-104] p 3174 N92-28195

PLASMAS (PHYSICS)
On the consequences of bi-Maxwellian distributions on parallel electric fields
[AD-A246206] p 3173 N92-27603
Kolmogorov spectra in a finite pressure plasma
[DE92-621531] p 3174 N92-28044
Plasma spray technology process parameters and applications
[DE92-620035] p 3078 N92-28159

PLASTIC COATINGS
Thermal control paints on LDEF: Results of sub-experiment 802-18 p 3078 N92-27275

PLASTIC DEFORMATION
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178

PLASTICIZERS
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161

PLASTICS
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178
PLATES (STRUCTURAL MEMBERS)
A method to determine moisture profiles from total moisture weight-gain data in polymeric composites
[AD-A247449] p 3077 N92-27550
PLUG NOZZLES
Application of finite element method to hypersonic nozzle flow computations p 3099 N92-27479
PLUGS
High pressure fiber optic connector plug
[AD-D015246] p 3166 N92-27373
PLUMES
Physics and diagnostics of laser ablation plume propagation for high-(Tc) superconductor film growth
[DE92-009386] p 3171 N92-27362
Multiple-wavelength transmission measurements in rocket motor plumes
[AD-A245999] p 3067 N92-27521
POINT DEFECTS
Effects of high energy electron irradiation on a yttrium barium(2) copper(3) oxygen(7-delta) high temperature superconductor
[AD-A246895] p 3177 N92-27983
POINTING CONTROL SYSTEMS
Antenna pointing system mounted on a flexible space structure
[NAL-TR-1119] p 3110 N92-27432
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809
POLARIMETERS
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[UTIAS-337] p 3116 N92-27633
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[ISBN-0-315-59931-6] p 3117 N92-28158
POLARIMETRY
An 11-CM full-matrix polarimetric radar for meteorological research
[AD-A246893] p 3082 N92-27506
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop
[NASA-CR-190461] p 3119 N92-28013
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan p 3119 N92-28017
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site p 3120 N92-28018
Snow and glacier mapping with polarimetric SAR p 3120 N92-28021
Monsoon 1990: Preliminary SAR results p 3120 N92-28022
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling p 3121 N92-28023
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert p 3088 N92-28025
Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030
External calibration of polarimetric radars using point and distributed targets p 3088 N92-28031
Calibration of a polarimetric imaging SAR p 3088 N92-28032
Information content of polarimetric SAR data p 3088 N92-28033
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037
POLARIZATION (WAVES)
Minimum polarization modulation: A highly bandwidth efficient coherent optical modulation scheme
[AD-A247556] p 3167 N92-27596
All-optical fiber Faraday rotation current sensor with heterodyne detection technique
[AD-D015226] p 3170 N92-28001
POLARIZATION CHARACTERISTICS
A comparison of the measured and modelled effects of brewster angle anisotropies upon pulsed XeCl excimer laser output
[ISBN-0-315-49569-3] p 3109 N92-27698
POLARIZED ELECTROMAGNETIC RADIATION
Observational analysis of the magneto-ionic plasma within and around extragalactic radio sources
[ISBN-0-315-56913-1] p 3195 N92-27685
POLARIZERS
A comparison of the measured and modelled effects of brewster angle anisotropies upon pulsed XeCl excimer laser output
[ISBN-0-315-49569-3] p 3109 N92-27698
POLICIES
Applying the take-grant protection model
[NASA-CR-190439] p 3147 N92-27561
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 22: Establishing a research agenda for Scientific and Technical Information (STI): Focus on the user
[NASA-TM-107930] p 3186 N92-28117
Air pollution effects on biodiversity
[PB92-170166] p 3125 N92-28208
POLLUTION CONTROL
Emissions trading and compliance: Regulatory incentives and barriers
[DE92-010280] p 3125 N92-27571
POLYATOMIC MOLECULES
Electron interactions with non-linear polyatomic molecules and their radicals and ions
[AD-A246492] p 3163 N92-27210
POLYCRYSTALS
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409
Diamond as an optical material
[AD-A247628] p 3167 N92-27599
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C
[AD-A246407] p 3069 N92-27752
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840
The determination of interfacial structure and phase transitions in Al/Cu and Al/Ni interfaces by means of surface extended x ray absorption fine structure
[DE92-009373] p 3074 N92-27913
POLYESTER RESINS
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
POLYIMIDES
Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292
X ray scattering studies of polyimide thin films from poly(amic acid)s functionalized with a methacrylate
[DE92-010120] p 3075 N92-27364
POLYMER MATRIX COMPOSITES
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
POLYMERIC FILMS
An ESR study of the UV degradation of FEP p 3079 N92-27287
Lithium rechargeable cell with a polymer cathode
[AD-A247577] p 3090 N92-27567
POLYMERIZATION
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967
POLYMERS
The viscoelastic characterization of polymer materials exposed to the low-Earth orbit environment p 3079 N92-27283
IMI: In partnership with industry
[CTN-92-60490] p 3068 N92-27614
Industrial Materials Institute
[CTN-92-60488] p 3068 N92-27650
POLYNOMIALS
Cracks on or near an interface p 3116 N92-27643
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes p 3103 N92-27678
Integrated optical pipelined polynomial processors
[AD-A248573] p 3092 N92-27992
POLYPEPTIDES
Investigation of polyisocyanates as second harmonic generating materials
[DE92-010445] p 3089 N92-27366
POLYSACCHARIDES
Precomplexation and activation of carboxylate and phosphate esters
[AD-A247778] p 3077 N92-27704
POSITION (LOCATION)
Thermal control paints on LDEF: Results of sub-experiment 802-18 p 3078 N92-27275
Comparison of Gulf Stream forecast model initialization and verification analyses
[AD-A246218] p 3134 N92-27604
PET studies of components of high-level vision
[AD-A246449] p 3140 N92-27822
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles p 3031 N92-27890
Location and characterization of in-cloud lightning currents by multiple station VHF and electric field measurements
[AD-A247051] p 3131 N92-27988
POSITION INDICATORS
Datums, ellipsoids, grids, and grid reference systems
[AD-A247651] p 3118 N92-27554
POSITION SENSING
Large-gap magnetic suspension systems p 3057 N92-27724
Progress of magnetic suspension and balance systems for wind tunnels in the USSR p 3053 N92-27803
Large-gap magnetic positioning system having advantageous configuration p 3065 N92-27814
Fiber-optic remote angular position sensor including a polarization track
[AD-D015210] p 3169 N92-27838
POSITIONING
A design, fabrication and test of a precision positioning servo drive for a multiplexed imaging system
[AD-A246507] p 3106 N92-27630
Precise positioning and compliance synthesis for automatic assembly using Lorentz levitation p 3062 N92-27797
Evaluation of absolute positioning using the Defense Mapping Agency's (GASP) program
[AD-A246818] p 3044 N92-28133
POSITIONING DEVICES (MACHINERY)
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
POSTFLIGHT ANALYSIS
Long Duration Exposure Facility experiment M0003 deintegration observation database p 3078 N92-27273
LDEF thermal control coatings post-flight analysis p 3078 N92-27276
Flouorescence measurements of the thermal control coatings on LDEF experiments S0069 and A0114 p 3078 N92-27278
Overview of the systems special investigation --- long duration exposure facility p 3079 N92-27303
New results from FRECOPA analysis --- long duration exposure facility p 3111 N92-27304
Mechanisms flown on LDEF p 3111 N92-27305
Effects of long term space environment exposure on optical substrates and coatings (S0050-2) p 3170 N92-27310
Radiation and temperature effects on LDEF fiber optic cable samples --- long duration exposure facility p 3171 N92-27316
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment p 3178 N92-27318
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
POTENTIAL FLOW
A boundary integral formulation for unsteady transonic potential flows p 3038 N92-27942
POTENTIAL THEORY
Recent applications of linear and nonlinear unsteady aerodynamics for aeroelastic analysis p 3038 N92-27940
POWDER (PARTICLES)
Characterization of powder coated thermoplastic composite
[AD-A247230] p 3068 N92-27383
Plasma spray technology process parameters and applications
[DE92-620035] p 3078 N92-28159
POWER SUPPLY CIRCUITS
DC uninterrupted power supply having instantaneous switching followed by low impedance switching
[AD-D015206] p 3089 N92-27398
POWERED LIFT AIRCRAFT
Experimental performance of three design factors for ventral nozzles for SSTOVL aircraft
[NASA-TM-105697] p 3049 N92-27669
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191
PRECIPITATION (METEOROLOGY)
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655

CCN spectra measurements as an active tracer of stratocumulus mechanisms --- cloud condensation nuclei
[AD-A246499] p 3129 N92-27668

PRECISION

A design, fabrication and test of a precision positioning servo drive for a multiplexed imaging system
[AD-A246507] p 3106 N92-27630

PRECONDITIONING

Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674

PREDICTION ANALYSIS TECHNIQUES

Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets
p 3193 N92-27261

New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267

A method to determine moisture profiles from total moisture weight-gain data in polymeric composites
[AD-A247449] p 3077 N92-27550

Monthly mean sea ice data from the polar ice prediction system, the regional polar ice prediction system (Barents Sea), and the regional polar ice prediction system (Greenland Sea)
[AD-A246145] p 3134 N92-27574

Development of the microstructure based stochastic life prediction models
[AD-A246447] p 3074 N92-27621

The NOGAPS forecast model: A technical description
[AD-A247216] p 3130 N92-27842

Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936

NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947

Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
p 3041 N92-27958

Effects of subordinate feedback to the supervisor and participation in decision-making in the prediction of organizational support
[AD-A249125] p 3183 N92-28083

Life prediction methodologies for composite materials
[AD-A248637] p 3070 N92-28202

PREDICTIONS

Monte Carlo modeling of atomic oxygen attack of polymers with protective coatings on LDEF
p 3079 N92-27281

Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow
p 3040 N92-27953

Future missions studies: Combining Schatten's solar activity prediction model with a chaotic prediction model
[NASA-CR-189865] p 3194 N92-28221

PREFLIGHT ANALYSIS

Radiation and temperature effects on LDEF fiber optic cable samples --- long duration exposure facility
p 3171 N92-27316

PREFORMS

Characterization of powder coated thermoplastic composite
[AD-A247230] p 3068 N92-27383

PREMIXED FLAMES

The coherent flamelet model for propulsion applications p 3073 N92-27486

PREPREGS

Space environmental effects on LDEF composites: Leading graphite/epoxy panel, selected trailing edge specimens p 3070 N92-27290

PRESSURE BROADENING

Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region
[AD-A248612] p 3072 N92-28064

PRESSURE DISTRIBUTION

Experimental investigation of the unsteady pressure field around an oscillating blade
[MITT-90-01] p 3094 N92-27407

Experimental performance of three design factors for ventral nozzles for SSTOVL aircraft
[NASA-TM-105697] p 3049 N92-27669

A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880

A time-linearization approach for unsteady transonic flows p 3038 N92-27941

Comparison of Euler and full potential methods for unsteady transonic flow calculations
p 3038 N92-27943

Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow
p 3040 N92-27953

Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956

NACA0012 airfoil data corrected for sidewall boundary-layer effects in the NAL two-dimensional transonic wind tunnel
[NAL-TM-640T] p 3042 N92-28151

PRESSURE EFFECTS

Investigation of the rate-controlling mechanism(s) for high temperature creep and the relationship between creep and melting by use of high pressure as a variable
[DE92-011058] p 3074 N92-27416

Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483

Johnson Space Center's regenerative life support systems test bed
[NASA-TM-107943] p 3144 N92-28157

PRESSURE GRADIENTS

Time-marching methods for secondary flow analysis in curved ducts p 3095 N92-27454

NACA0012 airfoil data corrected for sidewall boundary-layer effects in the NAL two-dimensional transonic wind tunnel
[NAL-TM-640T] p 3042 N92-28151

PRESSURE MEASUREMENT

A pressure measurement method using Electronically Scanner Pressure sensors (ESP) installed in a gust wind tunnel
[NAL-TM-638] p 3051 N92-27428

The benchmark aeroelastic models program: Description and highlights of initial results
p 3041 N92-27960

A review of scale effects on surfaces in unsteady motion p 3042 N92-27962

PRESSURE OSCILLATIONS

Investigation of an argon-filled thermoacoustic prime mover
[AD-A246751] p 3179 N92-28107

PRESSURE PULSES

Electrically actuated multiple store launcher
[AD-D015247] p 3054 N92-27374

PRESSURE REDUCTION

Turbulence structure and polymer drag reduction in adverse pressure gradient boundary layers
[AD-A246651] p 3104 N92-27757

PRESSURE SENSORS

A pressure measurement method using Electronically Scanner Pressure sensors (ESP) installed in a gust wind tunnel
[NAL-TM-638] p 3051 N92-27428

PRESSURE VESSEL DESIGN

Johnson Space Center's regenerative life support systems test bed
[NASA-TM-107943] p 3144 N92-28157

PRESSURE VESSELS

Fatigue life improvement of an autofrettage thick-walled pressure vessel with an external groove
[AD-A247233] p 3115 N92-27213

Methodology for the determination of criticality codes and recertification intervals for Tank Mounted Air Compressors (TMAC) and Base Mounted Air Compressors (BMAC)
[NASA-CR-189268] p 3114 N92-27649

Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update
[NASA-TM-105689] p 3067 N92-27878

Correlation between fracture toughness, Charpy V-notch impact energy, and yield strength for ASTM A723 steel
[AD-A249142] p 3075 N92-28143

PRESTRESSING

Fatigue life improvement of an autofrettage thick-walled pressure vessel with an external groove
[AD-A247233] p 3115 N92-27213

PRIMARY COSMIC RAYS

To the primary results of experiments in cosmic radiation particle investigation in the energy range E(greater than equals)2 TeV at the KOSMOS-1713 satellite with the SOKOL-2 equipment
[DE92-620935] p 3195 N92-27495

PRINCIPAL COMPONENTS ANALYSIS

SAR calibration and principal component analysis
p 3088 N92-28029

PRIORITIES

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 22: Establishing a research agenda for Scientific and Technical Information (STI): Focus on the user
[NASA-TM-107930] p 3186 N92-28117

PROBABILITY DENSITY FUNCTIONS

Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485

PROBABILITY DISTRIBUTION FUNCTIONS

Bivariate extreme value distributions
[NASA-CR-4444] p 3159 N92-27588

PROBABILITY THEORY

Visit to CALTECH and CERRA/ICASP6 reliability conference
[AD-A246432] p 3159 N92-27205

Combination of probabilities in looking for cosmic ray sources
[DE92-010350] p 3195 N92-27390

NAVSPASUR sensor performance study
[AD-A246592] p 3082 N92-27503

Reconstruction based on flexible prior models
[DE92-011263] p 3118 N92-28214

PROBLEM SOLVING

Measuring uncertainty by extracting fuzzy rules using rough sets and extracting fuzzy rules under uncertainty and measuring definability using rough sets
[NASA-CR-190394] p 3148 N92-27585

Causal models in the acquisition and instruction of programming skills
[AD-A248761] p 3141 N92-27969

Research and development of the p-version of the finite element model
[AD-A248582] p 3158 N92-28060

The RHET system: A sequence of self-guided tutorials
[AD-A248960] p 3151 N92-28082

Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144

Research into the development of a knowledge acquisition taxonomy
[NASA-CR-189939] p 3152 N92-28150

PROCESS CONTROL (INDUSTRY)

Statistical process control techniques for the telecommunications systems manager
[AD-A249122] p 3183 N92-28172

PROCESSING

Process for making semiconductor-on-insulator device interconnects
[AD-D015208] p 3089 N92-27445

Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734

PROCUREMENT

An assessment of the economic status of the antifriction bearing industry
[AD-A245373] p 3110 N92-27439

A micro computer based procurement system: An application of reverse engineering techniques
[AD-A245956] p 3147 N92-27544

FY 1992/1993 biennial RDT and E descriptive summaries: DARPA. Amended
[AD-A247452] p 3218 N92-27593

PRODUCT DEVELOPMENT

United States Air Force Summer Research program 1991. High School Apprenticeship Program (HSAP) reports. Volume 12: Rome Laboratory, Arnold Engineering Development Center
[AD-A248775] p 3219 N92-28099

United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 8: Rome Laboratory, Arnold Engineering Development Center, F. J. Seiler Research Laboratory
[AD-A248771] p 3219 N92-28111

PRODUCTION ENGINEERING

Characterization of powder coated thermoplastic composite
[AD-A247230] p 3068 N92-27383

PRODUCTION MANAGEMENT

Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827

PRODUCTIVITY

Relative utility of selected software requirement metrics
[AD-A246749] p 3152 N92-28106

PROFILOMETERS

Interaction of atomic oxygen with thin film and bulk copper: An XPS, AES, XRD, and profilometer study
p 3166 N92-27302

PROGRAM VERIFICATION (COMPUTERS)

Validation of a CANARI code by the computation of three dimensional turbulent flow in turbine valve
p 3050 N92-27462

An empirical study of fault detection by static units-consistency analysis
[AD-A247592] p 3147 N92-27569

A formal model of asynchronous communication and its use in mechanically verifying a biphase mark protocol
[NASA-CR-4433] p 3153 N92-27586

Software metrics for total development cycle evaluation
[AD-A246477] p 3148 N92-27606

PROGRAMMING LANGUAGES

Using ELROS to implement ISO application protocols
[DE92-010446] p 3145 N92-27367

PROJECT MANAGEMENT

Research and Technology Objectives and Plans Summary (RTOPS)
[NASA-TM-101862] p 3218 N92-27360

Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552
Computer software project management: An introduction
[AD-A246147] p 3147 N92-27576
Issues in NASA program and project management
[NASA-SP-6101(05)] p 3181 N92-27609
Future work in automated assembly of large space structures p 3156 N92-27779
Space Station: Contract oversight and performance provisions for major work packages. Briefing report to the Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space and Technology, House of Representatives
[GAO/NSIAD-92-171BR] p 3182 N92-27928
Establishing a Department of Defense program management body of knowledge
[AD-A246625] p 3182 N92-27979
Guidelines for the development of a Project Data Management Plan (PDMP)
[NASA-TM-107935] p 3183 N92-28156

PROJECT PLANNING
Future work in automated assembly of large space structures p 3156 N92-27779
United States Air Force Summer Research program 1991. High School Apprenticeship Program (HSAP) reports. Volume 12: Rome Laboratory, Arnold Engineering Development Center
[AD-A248775] p 3219 N92-28099

PROJECTILES
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257
Firing assembly for stored energy launcher
[AD-D015240] p 3054 N92-27628

PROLATE SPHEROIDS
Permeable prolate spheroid in an external field: Demagnetization and gradiometer performance
[AD-A245932] p 3106 N92-27857

PROLOG (PROGRAMMING LANGUAGE)
Expert System Development (ESD) shell
[DE92-621018] p 3184 N92-27497

PROPAGATION MODES
Theory of multilayer dielectric planar waveguides and its applications
[ISBN-0-315-49255-4] p 3168 N92-27625

PROPELLANT ADDITIVES
Erosion in a 20-mm-gun produced by normal and LOVA propellant charges
[ISL-CO-215/89] p 3080 N92-27927

PROPELLANT CHEMISTRY
First, second, and third generation high energy materials from cubane
[AD-A247559] p 3080 N92-27562
A study of the gas-phase chemistry of solid propellant ingredients using CO2 laser heating
[AD-A246510] p 3080 N92-27631
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161

PROPELLANT DECOMPOSITION
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161

PROPELLANT GRAINS
An investigation into the performance characteristics of a solid fuel SCRAMJET propulsion device
[AD-A246486] p 3048 N92-27206

PROPELLANT TESTS
Erosion in a 20-mm-gun produced by normal and LOVA propellant charges
[ISL-CO-215/89] p 3080 N92-27927

PROPELLANTS
High energy explosive yield enhancer using microencapsulation
[AD-D015195] p 3080 N92-27492

PROPELLER BLADES
BLADE: A propeller blade geometry generator program user's manual
[DREA-91-302] p 3149 N92-27697

PROPORTIONAL CONTROL
Control concepts for active magnetic bearings p 3060 N92-27743

PROPULSION
Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility
[NASA-TM-4394] p 3048 N92-27379
Nonequilibrium 3D flows of air through inlets p 3100 N92-27487
Development of an algebraic turbulence model for analysis of propulsion flows
[NASA-TM-105701] p 3157 N92-27517

PROPULSION SYSTEM CONFIGURATIONS
Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility
[NASA-TM-4394] p 3048 N92-27379
Aerothermodynamics of nozzle flows for advanced hypersonic propulsion systems p 3099 N92-27478
Application of finite element method to hypersonic nozzle flow computations p 3099 N92-27479
Flight-determined benefits of integrated flight-propulsion control systems
[NASA-TM-4393] p 3048 N92-27587
Propulsion systems using in situ propellants for a Mars ascent vehicle
[NASA-TM-105741] p 3067 N92-27654

PROPULSION SYSTEM PERFORMANCE
An investigation into the performance characteristics of a solid fuel SCRAMJET propulsion device
[AD-A246486] p 3048 N92-27206
Automated screening of propulsion system test data by neural networks, phase 1
[NASA-CR-184329] p 3066 N92-27403
CFD contributions during hypersonic airplane intake design p 3098 N92-27472
The coherent flamelet model for propulsion applications p 3073 N92-27486
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
Propulsion systems using in situ propellants for a Mars ascent vehicle
[NASA-TM-105741] p 3067 N92-27654

PROTECTION
Applying the take-grant protection model
[NASA-CR-190439] p 3147 N92-27561

PROTECTIVE CLOTHING
Thermal resistance values of some protective clothing ensembles
[AD-A245937] p 3144 N92-28166

PROTECTIVE COATINGS
Monte Carlo modeling of atomic oxygen attack of polymers with protective coatings on LDEF p 3079 N92-27281
The Canadian Space Agency, Space Station, Strategic Technologies for Automation and Robotics Program technology development activity in protection of materials from the low Earth orbit space environment p 3053 N92-27327
Tribological behavior of oil-lubricated, TiN-coated steel
[DE92-010500] p 3110 N92-27410
Thermally sprayed coating systems for surface protection and clearance control applications in aero engines
[PNR-90802] p 3048 N92-27422
High temperature silicide protective coating slurry
[AD-D015194] p 3076 N92-27491
Environmentally stable metal powders — gas atomization process
[AD-D015222] p 3074 N92-27619

PROTEIN SYNTHESIS
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

PROTOCOL (COMPUTERS)
Using ELROS to implement ISO application protocols
[DE92-010446] p 3145 N92-27367
A formal model of asynchronous communication and its use in mechanically verifying a biphase mark protocol
[NASA-CR-4433] p 3153 N92-27586
PDES Application Protocol Suite for Composites (PAS-C): State-Of-The-Art (SOTA) assessment for the PAS-C program
[AD-A247921] p 3069 N92-27849

PROTON BEAMS
LDEF: Dosimetric measurement results (AO 138-7 experiment) p 3165 N92-27231
Light-heavy ion measurements in CR-39 located on the Earth side of LDEF p 3165 N92-27234
Radiation model predictions and validation using LDEF data p 3165 N92-27237
Cosmogenic radioisotopes on LDEF surfaces p 3165 N92-27239

PROTON IRRADIATION
Measurements of the radiation dose to LDEF by means of passive dosimetry p 3165 N92-27230

PROTONS
Induced activation study of LDEF p 3164 N92-27228
Revised predictions of LDEF exposure to trapped protons p 3164 N92-27229
Absorbed dose measurements and predictions on LDEF p 3165 N92-27232
Bose-Einstein correlations in proton-antiproton collisions at square root of s equals 200 to 900 GeV
[ISBN-0-315-50129-4] p 3164 N92-27691

PROTOTYPES
Reusable software component retrieval via normalized algebraic specifications
[AD-A246002] p 3146 N92-27522
A reusable component retrieval system for prototyping
[AD-A246081] p 3147 N92-27524
An electrostatically suspended, micro-mechanical rate gyroscope p 3064 N92-27810
Research into the design and implementation of knowledge-base system
[AD-A247039] p 3151 N92-28075
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163

PROVING
Concept-flow diagrams: Method for design of computer-aided instruction
[AD-A246896] p 3150 N92-27984

PSYCHOLOGICAL FACTORS
Gender, equity, and job satisfaction
[AD-A246588] p 3139 N92-27501

PSYCHOLOGY
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142

PSYCHOPHYSICS
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050

PULSARS
A study of the diffuse interstellar medium through neutral hydrogen absorption observations toward pulsars
[ISBN-0-315-54703-0] p 3189 N92-27644

PULSE COMMUNICATION
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784

PULSE DURATION
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659

PULSED LASERS
Physics and diagnostics of laser ablation plume propagation for high-(Tc) superconductor film growth
[DE92-009386] p 3171 N92-27362
Laser radar system demonstration: System requirements review, second demonstration receiver
[AD-A246159] p 3108 N92-27601
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27718
Transport in ultra-dense plasmas produced by a picosecond laser pulse
[AD-A247827] p 3174 N92-27921
Large second-harmonic response of C60 thin films
[AD-A248957] p 3092 N92-28080

PULSED RADIATION
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007

PUMP IMPELLERS
An experimental study of a small high speed LH2 rocket pump: A suppression method of asynchronous shaft vibrations
[NAL-TR-1118] p 3110 N92-27431

PUMPS
The relationship between fuel lubricity and diesel injection system wear
[AD-A247927] p 3110 N92-27851

PURIFICATION
Macrocycles containing tin
[AD-A246866] p 3163 N92-27351

PYROLYSIS
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409

Q

QUALIFICATIONS
Management of the fleet satellite communications satellite acquisition for the Naval Postgraduate School
[AD-A246969] p 3082 N92-27400

QUALITY
Statistical process control techniques for the telecommunications systems manager
[AD-A249122] p 3183 N92-28172
QUALITY CONTROL
Equations for approximate lower confidence limits on process capability indices
[AD-A247591] p 3159 N92-27568
An analysis of total quality management in Aeronautical Systems Division
[AD-A246661] p 3114 N92-27760
Demonstration of manufacturing process for large area, multilayer piezoelectric composites
[AD-A246662] p 3069 N92-27761
Product assurance planning in an environment of increased need for accountability
[DE92-010850] p 3115 N92-28055
QUANTITATIVE ANALYSIS
Investigation of alpha particle induced single-event upsets in charge-coupled devices
[AD-A246268] p 3090 N92-27662
QUANTUM CHROMODYNAMICS
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
QUANTUM ELECTRODYNAMICS
Perturbation theory in light-cone quantization
[DE92-011076] p 3167 N92-27419
The Cornwall-Norton model in the strong coupling regime
[DE92-621061] p 3164 N92-27498
QUANTUM ELECTRONICS
Quantum devices
[AD-A247795] p 3177 N92-27705
Phenomena unique to sub-micrometer devices
[AD-A246655] p 3091 N92-27759
QUANTUM MECHANICS
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
QUANTUM STATISTICS
Bose-Einstein correlations in proton-antiproton collisions at square root of s equals 200 to 900 GeV
[ISBN-0-315-50129-4] p 3164 N92-27691
QUANTUM THEORY
Quantum devices
[AD-A247795] p 3177 N92-27705
Estimation of oblique electroweak corrections
[DE92-010742] p 3179 N92-28160
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
QUANTUM WELLS
Heterostructure device useable as a far infrared photodetector --- semiconductor devices
[AD-D015217] p 3168 N92-27616
Phenomena unique to sub-micrometer devices
[AD-A246655] p 3091 N92-27759
QUARKS
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
QUARTZ CRYSTALS
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment
p 3178 N92-27318
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
QUASARS
Examination of selected jets of extragalactic radio sources
[ETN-92-90827] p 3195 N92-27405
QUERY LANGUAGES
DFQL: A graphical dataflow query language
[AD-A246086] p 3180 N92-27526

R

RADAR
Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696
RADAR ANTENNAS
An 11-CM full-matrix polarimetric radar for meteorological research
[AD-A246893] p 3082 N92-27506
RADAR CORNER REFLECTORS
Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030
RADAR CROSS SECTIONS
NAVSPASUR sensor performance study
[AD-A246592] p 3082 N92-27503
Radiation, scattering, and guidance of electromagnetic fields by arbitrarily shaped structures embedded in layered dielectric media
[AD-A248951] p 3085 N92-28066
RADAR DATA
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520
Information content of polarimetric SAR data
p 3088 N92-28033
RADAR DETECTION
Improvement in radar detection under scan to scan processing and scan rate reduction
[AD-A247350] p 3082 N92-27386
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop
[NASA-CR-190461] p 3119 N92-28013
RADAR ECHOES
Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696
RADAR EQUIPMENT
Dual frequency along-track interferometry
p 3088 N92-28024
RADAR IMAGERY
Classification of SAR ship images with the aid of a syntactic pattern recognition algorithm
[DREO-TN-91-10] p 3084 N92-27695
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop
[NASA-CR-190461] p 3119 N92-28013
Progress towards SAR based ecosystem analysis
p 3119 N92-28014
The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery
p 3119 N92-28015
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan
p 3119 N92-28017
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019
Snow and glacier mapping with polarimetric SAR
p 3120 N92-28021
Monsoon 1990: Preliminary SAR results
p 3120 N92-28022
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert
p 3088 N92-28025
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada
p 3121 N92-28027
Calibration of a polarimetric imaging SAR
p 3088 N92-28032
The AIRSAR image browse system
p 3088 N92-28034
Geometric rectification and geocoding of JPL's AIRSAR data over hilly terrain p 3088 N92-28035
RADAR MAPS
Snow and glacier mapping with polarimetric SAR
p 3120 N92-28021
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038
RADAR MEASUREMENT
Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037
RADAR NAVIGATION
NAL Dornier 228-200 flight research airplane: Present status and outline of the installed equipment
[NAL-TM-637] p 3045 N92-27429
RADAR RECEIVERS
Laser radar system demonstration: System requirements review, second demonstration receiver
[AD-A246159] p 3108 N92-27601
Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030
RADAR REFLECTORS
External calibration of polarimetric radars using point and distributed targets p 3088 N92-28031
RADAR SCANNING
Improvement in radar detection under scan to scan processing and scan rate reduction
[AD-A247350] p 3082 N92-27386
RADAR SCATTERING
The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery
p 3119 N92-28015
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site
p 3120 N92-28018
External calibration of polarimetric radars using point and distributed targets p 3088 N92-28031
Radiation, scattering, and guidance of electromagnetic fields by arbitrarily shaped structures embedded in layered dielectric media
[AD-A248951] p 3085 N92-28066
RADAR SIGNATURES
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop
[NASA-CR-190461] p 3119 N92-28013
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site
p 3120 N92-28018
Snow and glacier mapping with polarimetric SAR
p 3120 N92-28021
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert
p 3088 N92-28025
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037
RADAR TARGETS
SAR calibration and principal component analysis
p 3088 N92-28029
External calibration of polarimetric radars using point and distributed targets p 3088 N92-28031
RADAR TRANSMITTERS
Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030
RADIATION BELTS
JPRS report: Science and technology. Central Eurasia: Space
[JPRS-USP-92-001] p 3053 N92-27931
RADIATION COUNTERS
Simulation of tail distributions in electron-positron circular colliders
[DE92-010743] p 3166 N92-27413
Analysis of the possibilities of suppression of the cosmic-ray background when detecting very high energy cosmic gamma quanta by means of a system of Cherenkov gamma telescopes with multichannel light receivers
[DE92-620916] p 3195 N92-27493
RADIATION DAMAGE
Radiation model predictions and validation using LDEF data p 3165 N92-27237
Diminishing radiation damage and enhancing immune system recovery: A study
[DREO-CR-91-646] p 3137 N92-27702
RADIATION DETECTORS
Ultra heavy cosmic ray experiment (A0178)
p 3196 N92-27241
Sudbury Neutrino Observatory
[DE92-011021] p 3194 N92-27415
Analysis of the possibilities of suppression of the cosmic-ray background when detecting very high energy cosmic gamma quanta by means of a system of Cherenkov gamma telescopes with multichannel light receivers
[DE92-620916] p 3195 N92-27493
Investigation of alpha particle induced single-event upsets in charge-coupled devices
[AD-A246268] p 3090 N92-27662
RADIATION DISTRIBUTION
A photon-phreak digs the LDEF happening
p 3164 N92-27226
Charge, energy, and LET spectra measurements of charged particles in P0006 experiment of LDEF
p 3165 N92-27233
RADIATION DOSAGE
Status of LDEF ionizing radiation measurements and analysis p 3196 N92-27223
Induced activation study of LDEF
p 3164 N92-27228
Revised predictions of LDEF exposure to trapped protons p 3164 N92-27229
Measurements of the radiation dose to LDEF by means of passive dosimetry p 3165 N92-27230
LDEF: Dosimetric measurement results (AO 138-7 experiment) p 3165 N92-27231
Absorbed dose measurements and predictions on LDEF p 3165 N92-27232
Light-heavy ion measurements in CR-39 located on the Earth side of LDEF p 3165 N92-27234
Development and application of a 3-D geometry/mass model for LDEF satellite ionizing radiation assessments
p 3165 N92-27236
Radiation model predictions and validation using LDEF data p 3165 N92-27237
Ultra heavy cosmic ray experiment (A0178)
p 3196 N92-27241

Future directions for LDEF ionizing radiation modeling and assessments p 3165 N92-27242
The effect of the low Earth orbit environment on space solar cells: Results of the advanced photovoltaic experiment (S0014) p 3124 N92-27320
Future radiation measurements in low Earth orbit --- long duration exposure facility p 3166 N92-27329
The carcinogenic risks of low-LET and high-LET ionizing radiations
[DE92-010477] p 3136 N92-27349

RADIATION EFFECTS
Second LDEF Post-Retrieval Symposium abstracts
[NASA-CP-10097] p 3196 N92-27218
Status of LDEF ionizing radiation measurements and analysis p 3196 N92-27223
Measurements of the radiation dose to LDEF by means of passive dosimetry p 3165 N92-27230
Three-dimensional shielding effects on charged particle fluences measured in the P0006 experiment in LDEF p 3165 N92-27235
Criticality of Be-7 concentration in LDEF p 3165 N92-27238
Future directions for LDEF ionizing radiation modeling and assessments p 3165 N92-27242
An ESR study of the UV degradation of FEP p 3079 N92-27287
Effects of long term space environment exposure on optical substrates and coatings (S0050-2) p 3170 N92-27310
Characterization of a space orbited incoherent fiber optic bundle --- long duration exposure facility p 3171 N92-27314
Radiation and temperature effects on LDEF fiber optic cable samples --- long duration exposure facility p 3171 N92-27316
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
Future radiation measurements in low Earth orbit --- long duration exposure facility p 3166 N92-27329
The carcinogenic risks of low-LET and high-LET ionizing radiations
[DE92-010477] p 3136 N92-27349
Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A246399] p 3162 N92-27751
The para radiation effects current simulator
[AD-A248652] p 3106 N92-27993
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007

RADIATION MEASUREMENT
Future radiation measurements in low Earth orbit --- long duration exposure facility p 3166 N92-27329
Small satellites and RPAs in global-change research, summary and conclusions
[AD-A247855] p 3055 N92-27388
Sudbury Neutrino Observatory
[DE92-011021] p 3194 N92-27415
To the primary results of experiments in cosmic radiation particle investigation in the energy range E(greater than equals)2 TeV at the KOSMOS-1713 satellite with the SOKOL-2 equipment
[DE92-620935] p 3195 N92-27495
ARM review, 1991
[AD-A247629] p 3125 N92-27511

RADIATION PROTECTION
Diminishing radiation damage and enhancing immune system recovery: A study
[DREO-CR-91-646] p 3137 N92-27702

RADIATION SHIELDING
Absorbed dose measurements and predictions on LDEF p 3165 N92-27232
Charge, energy, and LET spectra measurements of charged particles in P0006 experiment of LDEF p 3165 N92-27233
Three-dimensional shielding effects on charged particle fluences measured in the P0006 experiment in LDEF p 3165 N92-27235
Development and application of a 3-D geometry/mass model for LDEF satellite ionizing radiation assessments p 3165 N92-27236

RADIATION SOURCES
Combination of probabilities in looking for cosmic ray sources
[DE92-010350] p 3195 N92-27390

RADIATION SPECTRA
Revised predictions of LDEF exposure to trapped protons p 3164 N92-27229
Charge, energy, and LET spectra measurements of charged particles in P0006 experiment of LDEF p 3165 N92-27233

RADIATION TOLERANCE
Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology
[AD-A246989] p 3089 N92-27401
The para radiation effects current simulator
[AD-A248652] p 3106 N92-27993

RADIATIVE LIFETIME
Nonlinear optics in dense frequency narrow supersonic beams
[AD-A246647] p 3168 N92-27756

RADICALS
Electron interactions with non-linear polyatomic molecules and their radicals and ions
[AD-A246492] p 3163 N92-27210
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047

RADIO ALTIMETERS
Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques
[AD-A246066] p 3135 N92-27786

RADIO ASTRONOMY
Observational analysis of the magneto-ionic plasma within and around extragalactic radio sources
[ISBN-0-315-56913-1] p 3195 N92-27685

RADIO COMMUNICATION
National airspace data interchange network analysis
[AD-A247345] p 3044 N92-27217

RADIO EMISSION
Examination of selected jets of extragalactic radio sources
[ETN-92-90827] p 3195 N92-27405
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640

RADIO FREQUENCIES
Bi-directional optical transmission system for RF electrical energy
[AD-D015224] p 3169 N92-27999

RADIO GALAXIES
Observational analysis of the magneto-ionic plasma within and around extragalactic radio sources
[ISBN-0-315-56913-1] p 3195 N92-27685

RADIO JETS (ASTRONOMY)
Examination of selected jets of extragalactic radio sources
[ETN-92-90827] p 3195 N92-27405

RADIO RECEIVERS
Performance of a fast frequency-hopped noncoherent MFSK receiver with ratio-statistic combining over Rician fading channels with partial-band interference
[AD-A247034] p 3082 N92-27339

RADIO SIGNALS
Narrowband and broadband envelope cues for aural classification
[AD-A248693] p 3163 N92-28011

RADIO TELEMETRY
Development of telemetry for the agility flight test of a radio controlled fighter model
[AD-A248653] p 3055 N92-27994

RADIO WAVES
Survivability of meteor burst communication under adverse operating conditions
[AD-A248632] p 3085 N92-28065

RADIOACTIVE ISOTOPES
Induced activation study of LDEF p 3164 N92-27228

RADIOACTIVITY
Radioactivities induced in some LDEF samples p 3164 N92-27225
Collection, analysis, and archival of LDEF activation data p 3188 N92-27227
Induced activation study of LDEF p 3164 N92-27228

RADIOCHEMISTRY
Sudbury Neutrino Observatory
[DE92-011021] p 3194 N92-27415

RADIOMETERS
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
Visual photometric experiment data processing system
[AD-A248657] p 3044 N92-27964
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site p 3120 N92-28018
MAESTRO1 data set calibration: The JRC approach p 3122 N92-28028

RADIOSONDES
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28188

RAILGUN ACCELERATORS
Investigation of battery charged capacitor pulsed power systems for electromagnetic launcher experiments
[AD-A247325] p 3089 N92-27353

RAIN
Integrated microwave and infrared precipitation analysis
[AD-A246070] p 3130 N92-27787

RAIN FORESTS
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037

RAINDROPS
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655

RAMAN SPECTROSCOPY
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352

RAMJET MISSILES
Design and testing of a caseless solid-fuel integral-rocket ramjet engine for use in small tactical missiles
[AD-A246226] p 3066 N92-27198

RANDOM ACCESS MEMORY
Variable hold time in dynamic random access memories
[AD-A248602] p 3144 N92-28063

RANDOM NOISE
Frequency, amplitude, and phase tracking of nonsinusoidal signal in noise with extended Kalman filter
[AD-A246928] p 3090 N92-27508

RANDOM NUMBERS
A Cramer-Rao type lower bound for essentially unbiased parameter estimation
[AD-A246666] p 3160 N92-27915

RANGEFINDING
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520

RAPID TRANSIT SYSTEMS
Battery cars on superconducting magnetically levitated carriers: One commuting solution p 3065 N92-27811
Knoile Magnetrans: A magnetically levitated train system p 3065 N92-27812

RARE EARTH ALLOYS
Magnetostrictive direct drive motors
[NASA-CR-190451] p 3089 N92-27404

RARE EARTH ELEMENTS
Active fibres and optical amplifiers p 3086 N92-28089

RATINGS
Profile of an effective engineering manager
[AD-A246525] p 3180 N92-27528

RATIOS
Gradient estimation for ratios
[AD-A248453] p 3160 N92-28140

RAY TRACING
Distributed ray casting for high-speed volume rendering
[AD-A248167] p 3150 N92-27868

RAYLEIGH WAVES
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908

RAYLEIGH-RITZ METHOD
Dynamics and control of high precision magnetically levitated vibration isolation systems p 3058 N92-27730

RDX
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161

REACTING FLOW
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450
Three dimensional calculations of reactive flows within aircraft combustion chambers including some combustion models p 3101 N92-27490

REACTION KINETICS
The coherent flamelet model for propulsion applications p 3073 N92-27486
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837

REACTION WHEELS
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809
REACTIVITY
Atomic oxygen effects on LDEF experiment A0171 p 3079 N92-27280
Stability and reactivity of dimethylethoxysilane p 3073 N92-27286
High energy explosive yield enhancer using microencapsulation
[AD-D015195] p 3080 N92-27492
The structure and reactivity of boron surfaces
[AD-A247265] p 3071 N92-27510
REACTOR MATERIALS
Structural materials for high-heat flux applications
[DE92-010253] p 3073 N92-27346
READING
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142
REAGENTS
Stability and reactivity of dimethylethoxysilane p 3073 N92-27286
REAL GASES
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
REAL TIME OPERATION
An approach to integration of real-time software for an autonomous underwater vehicle
[AD-A245377] p 3154 N92-27441
NPSNET: Physically-based modeling enhancements to an object file format
[AD-A246594] p 3146 N92-27504
Applications of high speed networks
[AD-A246082] p 3153 N92-27525
The TRAINS project
[AD-A247447] p 3181 N92-27590
Fault tolerant real-time systems
[AD-A246644] p 3154 N92-27755
Situation assessment in the Paladin tactical decision generation system p 3032 N92-27892
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898
Parallel knowledge based systems architectures for in-flight mission management p 3034 N92-27904
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163
An efficient heuristic scheduler for hard real-time systems
[AD-A247322] p 3152 N92-28169
Robust intelligent flight control for hypersonic vehicles
[NASA-CR-185680] p 3051 N92-28209
REATTACHED FLOW
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
RECEIVERS
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers
[AD-A247574] p 3108 N92-27566
Subcarrier-multiplexed coherent optical video transmission using direct frequency modulation of semiconductor lasers
[AD-A247618] p 3167 N92-27597
RECOMBINATION REACTIONS
Hydrogenic ion recombination
[AD-A246886] p 3072 N92-28145
RECOMMENDATIONS
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222
RECTANGULAR WAVEGUIDES
Radiation, scattering, and guidance of electromagnetic fields by arbitrarily shaped structures embedded in layered dielectric media
[AD-A248951] p 3085 N92-28066
REDUCED GRAVITY
Follow up on the crystal growth experiments of the LDEF p 3178 N92-27268
A six degree-of-freedom magnetic bearing for microgravity vibration isolation p 3058 N92-27732
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
A microgravity vibration isolation rig p 3060 N92-27745
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747
Conference on Combined Effects: Radiation, Microg ravity, Trauma, and other Factors
[AD-A247799] p 3065 N92-27862
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991
[NASA-TM-107546] p 3136 N92-27877
Metabolic energy requirements for space flight
[NASA-TM-107933] p 3138 N92-28212
REDUNDANCY
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
REFLECTANCE
Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543
REFLEXES
Stress-induced enhancement of the startle reflex
[AD-A247096] p 3140 N92-27839
REFRACTED WAVES
Testing the accuracy of a three-dimensional acoustic coupled mode model
[AD-A247149] p 3162 N92-27369
REFRACTIVITY
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920
REFRIGERATING
Solid-vapor adsorption refrigeration system development
[PB92-164383] p 3081 N92-27715
REFRIGERATING MACHINERY
Solid-vapor adsorption refrigeration system development
[PB92-164383] p 3081 N92-27715
REGRESSION ANALYSIS
An investigation of multivariate adaptive regression splines for modeling and analysis of univariate and semi-multivariate time series systems
[AD-A246155] p 3159 N92-27578
An analysis of fixed wing tactical airlifter characteristics using an intra-theater airlift computer model
[AD-A246908] p 3045 N92-27719
Effects of subordinate feedback to the supervisor and participation in decision-making in the prediction of organizational support
[AD-A249125] p 3183 N92-28083
REGULATIONS
High-solids and 100-percent solids coatings: A state-of-the-art investigation
[AD-A247557] p 3076 N92-27539
REINFORCING FIBERS
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers
[DE92-010449] p 3069 N92-27856
RELIABILITY
Monte Carlo modeling of atomic oxygen attack of polymers with protective coatings on LDEF p 3079 N92-27281
Variable hold time in dynamic random access memories
[AD-A248602] p 3144 N92-28063
Survivability of meteor burst communication under adverse operating conditions
[AD-A248632] p 3085 N92-28065
RELIABILITY ANALYSIS
Approximate confidence limit procedures for complex systems
[AD-A247253] p 3159 N92-27384
Tactical communications network modelling and reliability analysis: An overview
[AD-A245339] p 3084 N92-27855
Estimating the reliability of a system on the basis of sample paths
[AD-A248585] p 3115 N92-28171
RELIEF MAPS
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038
RELIEF VALVES
Burst diaphragm sequence valve
[AD-D015241] p 3110 N92-27629
REMOTE CONTROL
Hand controller study of force and control mode p 3155 N92-27767
REMOTE MANIPULATOR SYSTEM
Automation and Robotics for Space-Based Systems, 1991
[NASA-CP-10098] p 3154 N92-27763
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781
REMOTE SENSING
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382
ERS-1, the European Remote Sensing satellite: A central point of the German Earth observation program
[REPT-14/91] p 3118 N92-27408
Project MEDSAT: The design of a remote sensing platform for malaria research and control
[NASA-CR-190008] p 3055 N92-27541
Laboratory measurements of the transmission and scattering of laser beams in optically dense clouds
[ISBN-0-315-58085-2] p 3108 N92-27647
Integrated microwave and infrared precipitation analysis
[AD-A246070] p 3130 N92-27787
Meteorological measurement guide
[AD-A247455] p 3130 N92-27859
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop
[NASA-CR-190461] p 3119 N92-28013
Progress towards SAR based ecosystem analysis p 3119 N92-28014
The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery p 3119 N92-28015
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site p 3120 N92-28018
Monsoon 1990: Preliminary SAR results p 3120 N92-28022
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
MAESTRO1 data set calibration: The JRC approach p 3122 N92-28028
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037
REMOTE SENSORS
Fiber-optic remote angular position sensor including a polarization track
[AD-D015210] p 3169 N92-27838
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881
REMOTELY PILOTED VEHICLES
A wind tunnel study of the pioneer remotely piloted vehicle
[AD-A247028] p 3045 N92-27335
Small satellites and RPAs in global-change research, summary and conclusions
[AD-A247855] p 3055 N92-27388
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles p 3031 N92-27890
Development of telemetry for the agility flight test of a radio controlled fighter model
[AD-A248653] p 3055 N92-27994
Flight testing of a half-scale remotely piloted vehicle
[AD-A248568] p 3046 N92-28123
REPLACING
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784
RESEARCH AIRCRAFT
NAL Dornier 228-200 flight research airplane: Present status and outline of the installed equipment
[NAL-TM-637] p 3045 N92-27429
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191
RESEARCH AND DEVELOPMENT
Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology
[AD-A246989] p 3089 N92-27401
Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734
Development and utilization of the University of California, Santa Barbara, free-electron laser
[AD-A248733] p 3109 N92-28124
Development and scientific utilization of the University of California, Santa Barbara free-electron laser
[AD-A246803] p 3109 N92-28131
Improving the impact of Federal scientific and technical information: A call for action p 3186 N92-28149
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 21: Technological innovation and technical communications: Their place in aerospace engineering curricula. A survey of European, Japanese, and US Aerospace Engineers and Scientists
[NASA-TM-107929] p 3187 N92-28184
RESEARCH FACILITIES
Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility
[NASA-TM-4394] p 3048 N92-27379
Johnson Space Center's regenerative life support systems test bed
[NASA-TM-107943] p 3144 N92-28157
RESEARCH MANAGEMENT
Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552

The TRAINS project
[AD-A247447] p 3181 N92-27590
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 22: Establishing a research agenda for Scientific and Technical Information (STI): Focus on the user
[NASA-TM-107930] p 3186 N92-28117

RESEARCH PROJECTS
NSERC/AES Industrial Research Chairs in climate research, McGill University
[CRG-89-4] p 3124 N92-27343
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 13: Wright Laboratory
[AD-A248776] p 3218 N92-28078
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 9: Wright Laboratory
[AD-A248772] p 3218 N92-28096
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) repoorts. Volume 10: Armstrong Laboratory
[AD-A248773] p 3218 N92-28097
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 11: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248774] p 3219 N92-28098
United States Air Force Summer Research program 1991. High School Apprenticeship Program (HSAP) reports. Volume 12: Rome Laboratory, Arnold Engineering Development Center
[AD-A248775] p 3219 N92-28099
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 6: Armstrong Laboratory, Wilford Hall Medical Center
[AD-A248769] p 3219 N92-28109
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 7: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248770] p 3219 N92-28110
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 8: Rome Laboratory, Arnold Engineering Development Center, F. J. Seiler Research Laboratory
[AD-A248771] p 3219 N92-28111
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5A: Wright Laboratory
[AD-A248767] p 3219 N92-28127
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5B: Wright Laboratory
[AD-A248768] p 3219 N92-28128
AES/NSERC Industrial Research Chairs (IRC) in climate research
[CGCR-91-9] p 3125 N92-28200

RESEARCH VEHICLES
National oceanographic fleet platform characteristics
[AD-A246452] p 3135 N92-27667

RESIDUAL STRESS
Fatigue life improvement of an autofrettage thick-walled pressure vessel with an external groove
[AD-A247233] p 3115 N92-27213
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409
Residual thermal stresses in graphite/PEEK (APC-2) laminates
[AD-A247450] p 3077 N92-27592
Bislactone curing agents for epoxy resins and polymers obtained therefrom
[AD-D015221] p 3077 N92-27618

RESIDUES
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps
p 3193 N92-27256
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257

RESONANCE FLUORESCENCE
Fluctuations and squeezing in resonance fluorescence emitted near a phase conjugator
[AD-A248735] p 3170 N92-28125

RESONANT FREQUENCIES
Heterostructure device useable as a far infrared photodetector --- semiconductor devices
[AD-D015217] p 3168 N92-27616
Characterization of superconducting magnetic bearings (dynamic stiffness and damping coefficient in axial direction) p 3059 N92-27737

RESONANT TUNNELING
Phenomena unique to sub-micrometer devices
[AD-A246655] p 3091 N92-27759

RESONANT VIBRATION
Add-on damping treatment for life extension of the F-15 upper-outer wing skin
[AD-A246149] p 3050 N92-27577

RESONATORS
Laser physics and laser techniques
[AD-A247326] p 3107 N92-27354
A circuit model for two-path cutoff waveguide dielectric resonator filters
[AD-A247785] p 3092 N92-27884
High performance YBCO films
[AD-A246802] p 3093 N92-28130

RESOURCES MANAGEMENT
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518
Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827
An information systems architecture analysis for Naval Air Systems Command
[AD-A247787] p 3184 N92-27885

RESPIRATORY PHYSIOLOGY
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990

RESPIRATORY SYSTEM
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990

RETINA
Reference frames in vision
[AD-A248743] p 3138 N92-27968

RETINAL IMAGES
Human image understanding
[AD-A247048] p 3140 N92-27825

REUSABLE SPACECRAFT
Retrievable payload carrier. Next generation Long Duration Exposure Facility: Update 1992
p 3066 N92-27325
Project UM-HAUL (UnManned Heavy pAyload Unloader and Lander): The design of a reusable lunar lander with an independent cargo unloader
[NASA-CR-189971] p 3054 N92-27540

REVERSE ENGINEERING
A micro computer based procurement system: An application of reverse engineering techniques
[AD-A245956] p 3147 N92-27544

REYNOLDS EQUATION
The application of a Navier-Stokes CFD method to civil engine intake flows p 3098 N92-27471
Comparative study of turbulence models in predicting hypersonic inlet flows
[NASA-TM-105720] p 3042 N92-28102

REYNOLDS NUMBER
The eddy structures in bounded shear flows
p 3037 N92-27712
A review of scale effects on surfaces in unsteady motion p 3042 N92-27962

RHEOLOGY
Rheological behavior and microstructure of ceramic particulate/aluminum alloy composites
[NASA-CR-190036] p 3074 N92-27542

RIBS (SUPPORTS)
Explicit solution of difference equation for the wavenumber response of fluid-loaded stiffened plate
[AD-A247922] p 3116 N92-27850

RIDING QUALITY
The concept of the mechanically active guideway as a novel approach to maglev p 3064 N92-27807

RIGID ROTORS
Stability and performance of notch filter control for unbalance response p 3058 N92-27731

RIGID WINGS
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957

RING CURRENTS
Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594

RIO GRANDE (NORTH AMERICA)
Determination of shear wave velocity structure in the Rio Grande rift through receiver function and surface wave analysis, appendix B
[AD-A246937] p 3128 N92-28072

RISK
The carcinogenic risks of low-LET and high-LET ionizing radiations
[DE92-010477] p 3136 N92-27349
An introduction to computer viruses
[DE92-010727] p 3147 N92-27570

ROBOT ARMS
Automation and Robotics for Space-Based Systems, 1991
[NASA-CP-10098] p 3154 N92-27763
Summary of compliant and multi-arm control at NASA. Langley Research Center p 3155 N92-27764
EVA robotics for Space Station Freedom: Dextrous Manipulator Development (DEMAND)
p 3155 N92-27765
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms
p 3113 N92-27780
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781
Comparison of unconstrained and constrained calibration methods
[AD-A246941] p 3111 N92-28074

ROBOT CONTROL
Automation and Robotics for Space-Based Systems, 1991
[NASA-CP-10098] p 3154 N92-27763
Summary of compliant and multi-arm control at NASA. Langley Research Center p 3155 N92-27764
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
Automated assembly of large space structures
p 3156 N92-27774
End-effector microprocessor p 3145 N92-27776
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms
p 3113 N92-27780
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
Comparison of unconstrained and constrained calibration methods
[AD-A246941] p 3111 N92-28074

ROBOT DYNAMICS
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
Comparison of the event-step algorithm to other path planning methods to avoid dynamic 3D obstacles
p 3033 N92-27896
Comparison of unconstrained and constrained calibration methods
[AD-A246941] p 3111 N92-28074

ROBOTICS
The Canadian Space Agency, Space Station, Strategic Technologies for Automation and Robotics Program technology development activity in protection of materials from the low Earth orbit space environment
p 3053 N92-27327
Automation and Robotics for Space-Based Systems, 1991
[NASA-CP-10098] p 3154 N92-27763
Autonomous planetary rover
[NASA-CR-190465] p 3173 N92-27866

ROBOTS
Automation and Robotics for Space-Based Systems, 1991
[NASA-CP-10098] p 3154 N92-27763
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782
Precise positioning and compliance synthesis for automatic assembly using Lorentz levitation
p 3062 N92-27797
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
Autonomous planetary rover
[NASA-CR-190465] p 3173 N92-27866
Comparison of the event-step algorithm to other path planning methods to avoid dynamic 3D obstacles
p 3033 N92-27896
Development of a truss joint for robotic assembly of space structures
[NASA-TP-3214] p 3117 N92-27974

ROCKET ENGINE CASES
Structural analysis of thermal fatigue failures on rocket combustion chambers by the finite element method
[NAL-TR-1117] p 3067 N92-27430

ROCKET ENGINE DESIGN
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627

ROCKET ENGINES
Magnetic bearings: A key technology for advanced rocket engines? p 3057 N92-27725

ROCKET LAUNCHERS
Dual modular rocket launcher
[AD-D015228] p 3046 N92-28002
ROCKET NOZZLES
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627
ROLL
Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment
p 3192 N92-27253
ROLLER BEARINGS
Computer graphics for bearing dynamic analysis
[AD-A247567] p 3148 N92-27584
ROTARY STABILITY
Self-adaptive aeropropulsion components-enhancing axial compressor performance
[AD-A246123] p 3049 N92-27817
ROTARY WING AIRCRAFT
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
ROTATING BODIES
Professor Jesse W. Beams and the first practical magnetic suspension p 3057 N92-27723
ROTATING MIRRORS
Professor Jesse W. Beams and the first practical magnetic suspension p 3057 N92-27723
ROTATION
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies
[NASA-TM-105416] p 3111 N92-27879
ROTOR DYNAMICS
AFRAPT Program at Texas A and M University research for advanced aircraft engine structures
[AD-A247040] p 3049 N92-28076
ROTORS
Viscous three-dimensional calculations of transonic fan performance p 3097 N92-27467
Feasibility of magnetic bearings for advanced gas turbine engines p 3059 N92-27738
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
Wide gap, permanent magnet biased magnetic bearing system p 3062 N92-27794
Design of bearings for rotor systems based on stability
p 3063 N92-27799
An evaluation of some strategies for vibration control of flexible rotors p 3063 N92-27800
ROUTES
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
Comparison of the event-step algorithm to other path planning methods to avoid dynamic 3D obstacles
p 3033 N92-27896
On board planning of 4D-trajectories
p 3033 N92-27897
Search route planning p 3033 N92-27900
An efficient method for three-dimensional route planning with different strategies and constraints
p 3033 N92-27901
ROVING VEHICLES
Autonomous planetary rover
[NASA-CR-190465] p 3173 N92-27866
RUNGE-KUTTA METHOD
Computations of unsteady flows around airfoil sections by explicit and implicit methods solving the Euler and Navier-Stokes equations p 3039 N92-27948
RURAL AREAS
Clean air act requirements for trace metals information
[PB92-164995] p 3125 N92-28206
RUTHENIUM
Magneto-optical studies of ultrathin ferromagnetic films
[DE92-010252] p 3176 N92-27345

S

S WAVES
Determination of shear wave velocity structure in the Rio Grande rift through receiver function and surface wave analysis, appendix B
[AD-A246937] p 3128 N92-28072
SADDLE POINTS
Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194
SAFETY DEVICES
Model A: High-temperature tribometer
[AD-A249258] p 3107 N92-28217
SALINITY
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666
The ocean's thermohaline circulation: Its stability, variability, and role in climate
[CGCR-91-12] p 3136 N92-28199
SALTS
Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008
SAMPLING
Performance parameter methodology update for information delivery times
[AD-A248897] p 3185 N92-27997
SATELLITE ANTENNAS
Antenna pointing system mounted on a flexible space structure
[NAL-TR-1119] p 3110 N92-27432
SATELLITE ATTITUDE CONTROL
Dynamics and control of an orbiting space platform based tethered satellite system
[ISBN-0-315-56001-0] p 3056 N92-27646
SATELLITE COMMUNICATION
Management of the fleet satellite communications satellite acquisition for the Naval Postgraduate School
[AD-A246969] p 3082 N92-27400
Communication analysis for the expendable explorer spacecraft
[NASA-CR-189273] p 3083 N92-27516
INMARSAT communications system: A systems approach
[AD-A246820] p 3087 N92-28134
SATELLITE IMAGERY
Satellite image display and processing with microcomputers: A proof-of-concept for the Navy Oceanographic Data Distribution System (NODDS)
[AD-A247247] p 3118 N92-27214
SATELLITE NETWORKS
Communication analysis for the expendable explorer spacecraft
[NASA-CR-189273] p 3083 N92-27516
INMARSAT communications system: A systems approach
[AD-A246820] p 3087 N92-28134
SATELLITE OBSERVATION
CCN spectra measurements as an active tracer of stratocumulus mechanisms --- cloud condensation nuclei
[AD-A246499] p 3129 N92-27668
SATELLITE ORBITS
NAVSPASUR sensor performance study
[AD-A246592] p 3082 N92-27503
SATELLITE ORIENTATION
Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment
p 3192 N92-27253
SATELLITE POWER TRANSMISSION
JPRS report: Science and technology. Central Eurasia: Space
[JPRS-USP-92-001] p 3053 N92-27931
Orbital solar electric power stations
p 3053 N92-27933
SATELLITE SOLAR ENERGY CONVERSION
JPRS report: Science and technology. Central Eurasia: Space
[JPRS-USP-92-001] p 3053 N92-27931
Orbital solar electric power stations
p 3053 N92-27933
SATELLITE SOLAR POWER STATIONS
Orbital solar electric power stations
p 3053 N92-27933
SATELLITE TRACKING
Management of the fleet satellite communications satellite acquisition for the Naval Postgraduate School
[AD-A246969] p 3082 N92-27400
NAVSPASUR sensor performance study
[AD-A246592] p 3082 N92-27503
SATURN (PLANET)
Electromagnetic effects in Saturn's B ring
p 3193 N92-27637
SATURN RINGS
Electromagnetic effects in Saturn's B ring
p 3193 N92-27637
SCALE EFFECT
A review of scale effects on surfaces in unsteady motion p 3042 N92-27962
SCALING LAWS
Analytical formula for ignition access condition in a magnetic fusion reactor
[PPL-114] p 3173 N92-27882
Operation path method for ignition criterion in a D-T tokamak reactor
[PPL-122] p 3174 N92-28193
SCANNERS
Project MEDSAT: The design of a remote sensing platform for malaria research and control
[NASA-CR-190008] p 3055 N92-27541
SCANNING TUNNELING MICROSCOPY
Scanning tunneling microscopy of the organic conductors (TMTSF)2X(X = C1O4-, REO4-)
[AD-A246909] p 3168 N92-27720
Atomic-level structure and dynamics of ordered metal electrodes as probed by infrared spectroscopy and scanning tunneling microscopy
[AD-A246738] p 3164 N92-28105
Scanning tunneling microscopy of the organic semiconductor ((eta-C5Me5) 2Ru(1,4-(2(2))-cyclophane)) (TCNQ)4
[AD-A246848] p 3093 N92-28121
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122
Scanning tunneling microscopy
[AD-A249262] p 3178 N92-28218
SCATHA SATELLITE
On the consequences of bi-Maxwellian distributions on parallel electric fields
[AD-A246206] p 3173 N92-27603
SCATTERING
Mid-range UV communications --- ultraviolet radiation
[AD-D015213] p 3083 N92-27615
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27716
A new composite roughness surface scattering model
[AD-A248891] p 3085 N92-27970
SCATTERING AMPLITUDE
Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696
SCATTERING CROSS SECTIONS
Electron interactions with non-linear polyatomic molecules and their radicals and ions
[AD-A246492] p 3163 N92-27210
SCHEDULES
National oceanographic fleet platform characteristics
[AD-A246452] p 3135 N92-27667
SCHEDULING
Fault tolerant real-time systems
[AD-A246644] p 3154 N92-27755
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163
An efficient heuristic scheduler for hard real-time systems
[AD-A247322] p 3152 N92-28169
SCHOOLS
An educational space seminar to increase American student interest in space careers
[AD-A246565] p 3179 N92-27499
SCHOTTKY DIODES
An XPS study of the formation of thin Pt and Ir silicide overlayers on Si (100) 2 x 1 surfaces
[AD-A245929] p 3178 N92-28165
SCHROEDINGER EQUATION
Nonlinear effects in optical fibers
p 3086 N92-28088
SCIENTIFIC SATELLITES
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382
SCIENTISTS
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 3: The impact of a sponsor letter on mail survey response rates
[NASA-TM-107923] p 3185 N92-28112
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 13: The information-seeking habits and practices of engineers
[NASA-TM-107931] p 3185 N92-28114
SCORPIUS CONSTELLATION
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636
SEA ICE
Current and future trends in Arctic climate research: Can changes of the Arctic sea ice be used as an early indicator of global warming?
[CGCR-91-1] p 3131 N92-27340
Climatic atlas of seasonal sea-level pressure and sea-ice concentration in the Hudson Bay-Baffin Bay-Labrador Sea region, 1953-1988
[CGCR-91-5] p 3132 N92-27342
Interannual variability of sea-level pressure, sea-ice, and runoff over the Arctic
[CGCR-91-6] p 3132 N92-27356
Sensitivity study of a dynamic thermodynamic sea-ice model
[CGCR-91-22] p 3132 N92-27370
Climatic atlas of seasonal and annual Arctic sea-level pressures, SLP anomalies, and sea-ice concentrations, 1953-1988
[CGCR-91-14] p 3129 N92-27427
Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-91-17] p 3133 N92-27547
Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-90-10] p 3133 N92-27548

Monthly mean sea ice data from the polar ice prediction system, the regional polar ice prediction system (Barents Sea), and the regional polar ice prediction system (Greenland Sea)
[AD-A246145] p 3134 N92-27574
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247928] p 3125 N92-27846

SEA LEVEL
Climatic atlas of the Northern Hemisphere seasonal and annual mean sea-level pressures, 1952-1987
[CGCR-90-17] p 3128 N92-27425
Climatic atlas of seasonal and annual Arctic sea-level pressures, SLP anomalies, and sea-ice concentrations, 1953-1988
[CGCR-91-14] p 3129 N92-27427

SEA TRUTH
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023

SEA WATER
Magnetic fields generated by internal ocean seawater motion
[AD-A246589] p 3132 N92-27502

SEALS (STOPPERS)
Evaluation of seals, lubricants, and adhesives used on LDEF p 3111 N92-27299

SEARCHING
Search route planning p 3033 N92-27900

SEAS
Review of the physical oceanography of the Labrador Sea
[CGCR-90-12] p 3132 N92-27357

SEATS
Pivoting seat for fighter aircraft
[AD-D015244] p 3143 N92-27372

SECONDARY FLOW
Time-marching methods for secondary flow analysis in curved ducts p 3095 N92-27454
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade
p 3095 N92-27457
Viscous three-dimensional calculations of transonic fan performance p 3097 N92-27467
Three dimensional solution of internal flows using a cell vertex finite volume method p 3098 N92-27473

SECONDARY ION MASS SPECTROMETRY
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry
[AD-A248410] p 3072 N92-28009

SECRETIONS
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

SECURITY
Global climate change and international security
[DE92-010868] p 3125 N92-28056

SEDIMENTS
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908

SEEDS
Final results of the Space Exposed Experiment Developed for Students (SEEDS) P-0004-2
p 3136 N92-27322
Continued results of the seeds in space experiment
p 3136 N92-27323

SEISMIC WAVES
Investigations of the seafloor coupling characteristics of the new ONR OBS and related questions
[AD-A246241] p 3131 N92-27199
Wave propagation at regional distances
[AD-A246890] p 3126 N92-27380

SEISMOGRAMS
Determination of shear wave velocity structure in the Rio Grande rift through receiver function and surface wave analysis, appendix B
[AD-A246937] p 3128 N92-28072

SEISMOLOGY
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908

SELF OSCILLATION
Investigation of a heat driven thermoacoustic prime mover above onset of self-oscillation
[AD-A246257] p 3162 N92-27202

SEMANTICS
Scope ambiguity and inference
[AD-A247448] p 3148 N92-27591
Natural language processing of captions for retrieving multimedia data
[AD-A247780] p 3184 N92-27860

SEMICONDUCTING FILMS
The plasma physics of processing discharges
[AD-A247560] p 3172 N92-27563

SEMICONDUCTOR DEVICES
Process for making semiconductor-on-insulator device interconnects
[AD-D015208] p 3089 N92-27445
Space division switches based on semiconductor optical amplifiers
[AD-A247619] p 3176 N92-27598
Space-division optical switches based on semiconductor optical amplifiers
[AD-A247616] p 3167 N92-27608
Monolithic integration of semiconductor and superconductor components
[AD-A248952] p 3092 N92-28067
Millimeter-wave quasi-optical arrays
[AD-A248456] p 3093 N92-28141

SEMICONDUCTOR DIODES
Solid state research
[AD-A247338] p 3176 N92-27216

SEMICONDUCTOR LASERS
Solid state research
[AD-A247338] p 3176 N92-27216
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers
[AD-A247574] p 3108 N92-27566
Subcarrier-multiplexed coherent optical video transmission using direct frequency modulation of semiconductor lasers
[AD-A247618] p 3167 N92-27597
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181

SEMICONDUCTORS (MATERIALS)
Process for making semiconductor-on-insulator device interconnects
[AD-D015208] p 3089 N92-27445
Heterostructure device useable as a far infrared photodetector --- semiconductor devices
[AD-D015217] p 3168 N92-27616
Theory of semiconducting superlattices and microstructures
[AD-A248681] p 3092 N92-27965
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181
Scanning tunneling microscopy
[AD-A249262] p 3178 N92-28218

SENSITIVITY
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
Sensitivity study of a dynamic thermodynamic sea-ice model
[CGCR-91-22] p 3132 N92-27370
Sensitivity of global warming potentials to the assumed background atmosphere
[DE92-011072] p 3124 N92-27417

SENSORS
Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328
Optical fiber sensors p 3086 N92-28090
Smart structures: The relevance of fibre optics
p 3086 N92-28091

SENSORY PERCEPTION
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916

SEPARATED FLOW
An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399
A computational study of tip leakage flow and losses in a linear turbine cascade p 3095 N92-27453
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications
p 3037 N92-27937
A review of scale effects on surfaces in unsteady motion p 3042 N92-27962

SEQUENCING
Attentional demands and effects of extended practice in a one-finger key-pressing task
[AD-A245384] p 3138 N92-27444

SEQUENTIAL ANALYSIS
Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661

SERVICE LIFE
Life prediction methodologies for composite materials
[AD-A248637] p 3070 N92-28202

SERVICE MODULES
Optical Terminal Definition for the Future Service Growth (FSG) module of the Advanced Tracking and Data Relay Satellite (ATDRSS)
[NASA-CR-189270] p 3055 N92-28219

SERVOMECHANISMS
A design, fabrication and test of a precision positioning servo drive for a multiplexed imaging system
[AD-A246507] p 3106 N92-27630

SET THEORY
Measuring uncertainty by extracting fuzzy rules using rough sets and extracting fuzzy rules under uncertainty and measuring definability using rough sets
[NASA-CR-190394] p 3148 N92-27585
A formal definition of the object-oriented paradigm for requirements analysis
[AD-A246814] p 3044 N92-28132

SEYFERT GALAXIES
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636

SHADOWS
LDEF microenvironments, observed and predicted
p 3066 N92-27220

SHAFTS (MACHINE ELEMENTS)
Fiber-optic remote angular position sensor including a polarization track
[AD-D015210] p 3169 N92-27838
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies
[NASA-TM-105416] p 3111 N92-27879

SHALLOW WATER
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666

SHAPE MEMORY ALLOYS
Shape memory effect alloys
[DE92-619932] p 3074 N92-27875

SHAPES
Magneto-optical studies of ultrathin ferromagnetic films
[DE92-010252] p 3176 N92-27345
Effects of color vision deficiency on detection of color-highlighted targets in a simulated air traffic control display
[AD-A246586] p 3139 N92-27500

SHEAR FLOW
The eddy structures in bounded shear flows
p 3037 N92-27712

SHEAR LAYERS
The eddy structures in bounded shear flows
p 3037 N92-27712
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853
A study of compressible turbulence
[AD-A247001] p 3105 N92-27986

SHEAR STRAIN
Adiabatic shear bands in simple and dipolar viscoplastic materials
[AD-A246055] p 3077 N92-27545

SHEAR STRESS
An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399
A study of compressible turbulence
[AD-A247001] p 3105 N92-27986
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178

SHIP HULLS
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139

SHIPS
Applications of high speed networks
[AD-A246082] p 3153 N92-27525
National oceanographic fleet platform characteristics
[AD-A246452] p 3135 N92-27667
Classification of SAR ship images with the aid of a syntactic pattern recognition algorithm
[DREO-TN-91-10] p 3084 N92-27695

SHOCK ABSORBERS
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627

SHOCK LOADS
The relevance of the DeBroglie velocity (V1 = h/2md1) to shock loading induced reactions in lead azide
[AD-A246478] p 3177 N92-27607

SHOCK WAVES
Experimental investigation of turbulence behavior in shock wave/turbulent boundary layer interactions
[AD-A247792] p 3104 N92-27886
Nonlinear aspects of shock response in isolated accelerometers
[DE92-010827] p 3107 N92-28054
The structure of MFD shock waves in a model of two fluids
[DE92-622860] p 3106 N92-28216

SHORELINES
Hindcast wave information for the great lakes: Lake Ontario
[AD-A246446] p 3135 N92-27820

SHORT TAKEOFF AIRCRAFT
Experimental performance of three design factors for ventral nozzles for SSTOVL aircraft
[NASA-TM-105697] p 3049 N92-27669
Evaluation of high lift devices of the quiet STOL experimental aircraft ASKA
[NAL-TR-1102] p 3046 N92-28153
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191
SHORT WAVE RADIATION
Kolmogorov spectra in a finite pressure plasma
[DE92-621531] p 3174 N92-28044
SHUTTLE MISSION SIMULATOR
RMS active damping augmentation
p 3155 N92-27771
SIDEBANDS
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659
SIERRA NEVADA MOUNTAINS (CA)
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada
p 3121 N92-28027
SIGNAL ANALYSIS
The application of chaos theory to an alumina sensor for aluminum reduction cells
[DE92-010630] p 3089 N92-27395
SIGNAL DETECTION
Performance of a fast frequency-hopped noncoherent MFSK receiver with ratio-statistic combining over Rician fading channels with partial-band interference
[AD-A247034] p 3082 N92-27339
All-optical fiber Faraday rotation current sensor with heterodyne detection technique
[AD-D015226] p 3170 N92-28001
SIGNAL PROCESSING
Improvement in radar detection under scan to scan processing and scan rate reduction
[AD-A247350] p 3082 N92-27386
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520
Monitoring of global acoustic transmissions: Signal processing and preliminary data analysis
[AD-A246572] p 3162 N92-27532
Design of digital signal processing algorithms for enhancing the measurements of ultra-fast electromagnetic transients
[AD-A246269] p 3148 N92-27663
Infrared horizon detection
[AD-A246904] p 3084 N92-27717
Adaptive digital notch filtering
[AD-A248043] p 3091 N92-27785
Video-text processing by using Motorola 68020 CPU and its environment
[AD-A245775] p 3184 N92-27911
Smart structures: The relevance of fibre optics
p 3086 N92-28091
SIGNAL TO NOISE RATIOS
High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520
SIGNAL TRANSMISSION
Subcarrier-multiplexed coherent optical video transmission using direct frequency modulation of semiconductor lasers
[AD-A247618] p 3167 N92-27597
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
SIGNATURE ANALYSIS
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016
SIGNS AND SYMPTOMS
What and where in visual attention: Evidence from the neglect syndrome
[AD-A246932] p 3139 N92-27509
SILANES
Stability and reactivity of dimethylethoxysilane
p 3073 N92-27286
SILICA GLASS
Effects of long term space environment exposure on optical substrates and coatings (S0050-2)
p 3170 N92-27310
LEO effects on candidate solar cell cover materials
p 3124 N92-27321
SILICIDES
High temperature silicide protective coating slurry
[AD-D015194] p 3076 N92-27491
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837
An XPS study of the formation of thin Pt and Ir silicide overlayers on Si (100) 2 x 1 surfaces
[AD-A245929] p 3178 N92-28165
SILICON
Silicon-on-insulator photonics
[AD-A247957] p 3091 N92-27847
SILICON CARBIDES
Rheological behavior and microstructure of ceramic particulate/aluminum alloy composites
[NASA-CR-190036] p 3074 N92-27542
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers
[DE92-010449] p 3069 N92-27856
SILICON DIOXIDE
Silazane to silica p 3079 N92-27285
Stability and reactivity of dimethylethoxysilane
p 3073 N92-27286
Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology
[AD-A246989] p 3089 N92-27401
Passivation and gating of GaAs and Si surfaces using pseudomorphic structures
[AD-A246990] p 3176 N92-27402
SILICON FILMS
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837
An XPS study of the formation of thin Pt and Ir silicide overlayers on Si (100) 2 x 1 surfaces
[AD-A245929] p 3178 N92-28165
SILICON NITRIDES
Spectroscopy and reactions of hydrazoic acid on silicon single crystal surfaces. (2). HN3 and DN3 on Si (100)
[AD-A247047] p 3177 N92-28077
SILICON TRANSISTORS
Monolithic integration of semiconductor and superconductor components
[AD-A248952] p 3092 N92-28067
SILICONES
Silazane to silica p 3079 N92-27285
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment
p 3178 N92-27318
SILVER
Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008
Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials
[AD-A248736] p 3078 N92-28126
SILVER COMPOUNDS
Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008
SILVER OXIDES
Angular distributions of 5eV atomic oxygen scattered from solid surfaces on the LDEF satellite
p 3165 N92-27301
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
SIMPLIFICATION
Performance parameter methodology update for information delivery times
[AD-A248897] p 3185 N92-27997
SIMULATION
Further analysis of LDEF FRECOPA micrometeroid remnants p 3193 N92-27260
Area-of-Interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863
Optimal guidance anticipating missile performance
p 3034 N92-27902
An efficient heuristic scheduler for hard real-time systems
[AD-A247322] p 3152 N92-28169
Conditions for the applicability of the regenerative method
[AD-A248598] p 3160 N92-28182
SIMULATORS
Propulsion simulator for magnetically suspended wind tunnel models p 3052 N92-27801
Area-of-Interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005
Scanning tunneling microscopy
[AD-A249262] p 3178 N92-28218
SINGLE CRYSTALS
Characterization of semi-insulating gallium arsenide
[AD-A246511] p 3177 N92-27632
Effects of high energy electron irradiation on a yttrium barium(2) copper(3) oxygen(7-delta) high temperature superconductor
[AD-A246895] p 3177 N92-27983
Research in high dielectric properties of ferroelectric materials
[AD-A246899] p 3177 N92-27985
Low capacitance field emitter array and method of manufacture therefor
[AD-D015225] p 3092 N92-28000
Spectroscopy and reactions of hydrazoic acid on silicon single crystal surfaces. (2). HN3 and DN3 on Si (100)
[AD-A247047] p 3177 N92-28077
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon
[AD-A248958] p 3178 N92-28081
Atomic-level structure and dynamics of ordered metal electrodes as probed by infrared spectroscopy and scanning tunneling microscopy
[AD-A246738] p 3164 N92-28105
SINGLE EVENT UPSETS
Charge, energy, and LET spectra measurements of charged particles in P0006 experiment of LDEF
p 3165 N92-27233
Investigation of alpha particle induced single-event upsets in charge-coupled devices
[AD-A246268] p 3090 N92-27662
SINGLE STAGE TO ORBIT VEHICLES
Robust intelligent flight control for hypersonic vehicles
[NASA-CR-185680] p 3051 N92-28209
SITTING POSITION
Inspired gas composition influences recovery from experimental venous air embolism
[AD-A247004] p 3138 N92-28135
SKIN FRICTION
Special Course on Skin Friction Drag Reduction
[AGARD-R-786] p 3036 N92-27706
Basic concepts on boundary layers
p 3036 N92-27707
Aircraft drag reduction p 3036 N92-27709
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
SKY RADIATION
Modelling solar radiation in the Arctic: An improved method for the subdivision of global radiation
[AD-A246271] p 3194 N92-27818
SLEEP
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094
SLEEP DEPRIVATION
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094
SLEWING
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782
Performance of a superconducting large-angle magnetic suspension p 3065 N92-27815
SLIDING FRICTION
Tribological behavior of oil-lubricated, TiN-coated steel
[DE92-010500] p 3110 N92-27410
SLURRIES
High temperature silicide protective coating slurry
[AD-D015194] p 3076 N92-27491
Rheological behavior and microstructure of ceramic particulate/aluminum alloy composites
[NASA-CR-190036] p 3074 N92-27542
SMALL SCIENTIFIC SATELLITES
Small satellites and RPAs in global-change research, summary and conclusions
[AD-A247855] p 3055 N92-27388
SMART STRUCTURES
System requirements specification for SMART structures mode p 3149 N92-27830
Smart structures: The relevance of fibre optics
p 3086 N92-28091
SMOKE
A procedure for obtaining an algebraic approximation to certain integrals
[AD-A245371] p 3157 N92-27437
SNOW
Snow and glacier mapping with polarimetric SAR
p 3120 N92-28021
SNOW COVER
Snow and glacier mapping with polarimetric SAR
p 3120 N92-28021
SODIUM IODIDES
Sensitivity of LDEF foil analyses using ultra-low background germanium versus large NaI(T1) multidimensional spectrometers p 3196 N92-27224

SODIUM 22
Sensitivity of LDEF foil analyses using ultra-low background germanium versus large NaI(T1) multidimensional spectrometers p 3196 N92-27224
SOFTWARE ENGINEERING
An empirical study of fault detection by static units-consistency analysis
[AD-A247592] p 3147 N92-27569
Computer software project management: An introduction
[AD-A246147] p 3147 N92-27576
Executive system software design and expert system implementation p 3152 N92-27778
From an automated flight-test management system to a flight-test engineer's workstation p 3035 N92-27907
UT40 STARS reuse concept. Volume 1: Conceptual framework for reuse process version 1.0
[AD-A247267] p 3150 N92-27919
Relative utility of selected software requirement metrics
[AD-A246749] p 3152 N92-28106
Research into the development of a knowledge acquisition taxonomy
[NASA-CR-189939] p 3152 N92-28150
SOFTWARE REUSE
UT40 STARS reuse concept. Volume 1: Conceptual framework for reuse process version 1.0
[AD-A247267] p 3150 N92-27919
SOFTWARE TOOLS
Enhancement of image processing capabilities for different environments
[AD-A246956] p 3145 N92-27333
Using ELROS to implement ISO application protocols
[DE92-010446] p 3145 N92-27367
The multicomputer toolbox approach to concurrent BLAS and LACs
[DE92-010401] p 3146 N92-27391
Reusable software component retrieval via normalized algebraic specifications
[AD-A246002] p 3146 N92-27522
Software tools for acoustic database management
[AD-A247636] p 3181 N92-27553
An empirical study of fault detection by static units-consistency analysis
[AD-A247592] p 3147 N92-27569
Geometric modeling for computer aided design
[NASA-CR-190363] p 3149 N92-27829
System requirements specification for SMART structures mode p 3149 N92-27830
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages p 3149 N92-27831
Application driven interface generation for EASIE p 3145 N92-27832
Engine structures modeling software system: Computer code. User's manual
[NASA-CR-189154] p 3116 N92-27872
MAESTRO1 data set calibration: The JRC approach p 3122 N92-28028
SOI (SEMICONDUCTORS)
Silicon-on-insulator photonics
[AD-A247957] p 3091 N92-27847
SOIL MECHANICS
Geotechnical centrifuge use at University of Cambridge Geotechnical Centre, August-September 1991
[AD-A246490] p 3126 N92-27209
Fabric-stress-deformation relations in granular materials
[AD-A247009] p 3117 N92-28138
SOIL MOISTURE
Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019
Soil moisture measurements from airborne SAR p 3120 N92-28020
Monsoon 1990: Preliminary SAR results p 3120 N92-28022
SOIL SCIENCE
Geotechnical centrifuge use at University of Cambridge Geotechnical Centre, August-September 1991
[AD-A246490] p 3126 N92-27209
SOILS
Investigations of the seafloor coupling characteristics of the new ONR OBS and related questions
[AD-A246241] p 3131 N92-27199
Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543
SOL-GEL PROCESSES
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409
SOLAR ACTIVITY
Solar activity cycle
[AD-A247212] p 3194 N92-27841
Future missions studies: Combining Schatten's solar activity prediction model with a chaotic prediction model
[NASA-CR-189865] p 3194 N92-28221
SOLAR ACTIVITY EFFECTS
Revised predictions of LDEF exposure to trapped protons p 3164 N92-27229
LDEF: Dosimetric measurement results (AO 138-7 experiment) p 3165 N92-27231
SOLAR ARRAYS
LEO effects on candidate solar cell cover materials p 3124 N92-27321
SOLAR ATMOSPHERE
Identification of driver gas-associated Bz events and prediction of their orientation
[AD-A248480] p 3194 N92-28059
SOLAR CELLS
The effect of the low Earth orbit environment on space solar cells: Results of the advanced photovoltaic experiment (S0014) p 3124 N92-27320
LEO effects on candidate solar cell cover materials p 3124 N92-27321
SOLAR CORONA
VLA, PHOENIX and BATSE observations of an X1 flare
[AD-A248461] p 3194 N92-27935
SOLAR CYCLES
Solar activity cycle
[AD-A247212] p 3194 N92-27841
SOLAR ENERGY
Modelling solar radiation in the Arctic: An improved method for the subdivision of global radiation
[AD-A246271] p 3194 N92-27818
SOLAR ENERGY CONVERSION
The effect of the low Earth orbit environment on space solar cells: Results of the advanced photovoltaic experiment (S0014) p 3124 N92-27320
Orbital solar electric power stations p 3053 N92-27933
SOLAR FLARES
VLA, PHOENIX and BATSE observations of an X1 flare
[AD-A248461] p 3194 N92-27935
Identification of driver gas-associated Bz events and prediction of their orientation
[AD-A248480] p 3194 N92-28059
SOLAR MAGNETIC FIELD
Identification of driver gas-associated Bz events and prediction of their orientation
[AD-A248480] p 3194 N92-28059
SOLAR NEUTRINOS
Sudbury Neutrino Observatory
[DE92-011021] p 3194 N92-27415
SOLAR OSCILLATIONS
Solar activity cycle
[AD-A247212] p 3194 N92-27841
SOLAR PHYSICS
Identification of driver gas-associated Bz events and prediction of their orientation
[AD-A248480] p 3194 N92-28059
Future missions studies: Combining Schatten's solar activity prediction model with a chaotic prediction model
[NASA-CR-189865] p 3194 N92-28221
SOLAR RADIATION
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309
Ruled and holographic experiment (AO 138-5) --- long duration exposure facility p 3107 N92-27312
Modelling solar radiation in the Arctic: An improved method for the subdivision of global radiation
[AD-A246271] p 3194 N92-27818
SOLAR REFLECTORS
LDEF thermal control coatings post-flight analysis p 3078 N92-27276
SOLAR SENSORS
The effect of the low Earth orbit environment on space solar cells: Results of the advanced photovoltaic experiment (S0014) p 3124 N92-27320
SOLAR X-RAYS
VLA, PHOENIX and BATSE observations of an X1 flare
[AD-A248461] p 3194 N92-27935
SOLDERS
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246836] p 3075 N92-28119
SOLID PROPELLANT COMBUSTION
Multiple-wavelength transmission measurements in rocket motor plumes
[AD-A245999] p 3067 N92-27521
SOLID PROPELLANT ROCKET ENGINES
Multiple-wavelength transmission measurements in rocket motor plumes
[AD-A245999] p 3067 N92-27521
SOLID PROPELLANTS
An investigation into the performance characteristics of a solid fuel SCRAMJET propulsion device
[AD-A246486] p 3048 N92-27206
Burst diaphragm sequence valve
[AD-D015241] p 3110 N92-27629
A study of the gas-phase chemistry of solid propellant ingredients using CO2 laser heating
[AD-A246510] p 3080 N92-27631
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161
SOLID STATE
Solid state research
[AD-A247338] p 3176 N92-27216
SOLID STATE LASERS
Holmium laser pumped with a neodymium laser
[AD-D015220] p 3108 N92-27617
SOLID SURFACES
Angular distributions of 5eV atomic oxygen scattered from solid surfaces on the LDEF satellite p 3165 N92-27301
SOLID-SOLID INTERFACES
The determination of interfacial structure and phase transitions in Al/Cu and Al/Ni interfaces by means of surface extended x ray absorption fine structure
[DE92-009373] p 3074 N92-27913
SOLIDS
An analysis of the Stress Wave in Solids (SWIS) finite element code
[AD-A245921] p 3115 N92-27573
Solid-vapor adsorption refrigeration system development
[PB92-164383] p 3081 N92-27715
SOLITARY WAVES
Numerical investigations of breather solitons in nonlinear vibratory lattices
[AD-A246524] p 3178 N92-27527
Nonlinear effects in optical fibers p 3086 N92-28088
Active fibres and optical amplifiers p 3086 N92-28089
SOLVENTS
Simple-reversible fiber-optic chemical sensors using solvatochromic dyes
[DE92-010441] p 3166 N92-27365
SONAR
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513
Narrowband and broadband envelope cues for aural classification
[AD-A248693] p 3163 N92-28011
SOUND PROPAGATION
Testing the accuracy of a three-dimensional acoustic coupled mode model
[AD-A247149] p 3162 N92-27369
SOUND WAVES
Investigation of a heat driven thermoacoustic prime mover above onset of self-oscillation
[AD-A246257] p 3162 N92-27202
Experimental investigation of energy dissipation in finite-amplitude standing waves
[AD-A246428] p 3109 N92-27203
Testing the accuracy of a three-dimensional acoustic coupled mode model
[AD-A247149] p 3162 N92-27369
Monitoring of global acoustic transmissions: Signal processing and preliminary data analysis
[AD-A246572] p 3162 N92-27532
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques
[AD-A246066] p 3135 N92-27786
Sound attenuation characteristics of the DH-133A helmet
[AD-A248351] p 3143 N92-27991
Investigation of an argon-filled thermoacoustic prime mover
[AD-A246751] p 3179 N92-28107
SOUNDING
Interpretation of time domain electromagnetic soundings near geological contacts
[DE92-010467] p 3126 N92-27347
SPACE COMMERCIALIZATION
Retrievable payload carrier. Next generation Long Duration Exposure Facility: Update 1992 p 3066 N92-27325
Development of a truss joint for robotic assembly of space structures
[NASA-TP-3214] p 3117 N92-27974
SPACE DEBRIS
Micrometeoroids and debris on LDEF p 3192 N92-27243

Detailed examination of LDEF's frame and the A0178 thermal blankets by the meteoroid and debris special investigations group p 3192 N92-27244

LDEF experiment M0003 meteoroid and debris survey p 3192 N92-27245

Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246

Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247

Hypervelocity impact facility for simulating materials exposure to impact by space debris p 3192 N92-27250

Meteoroid and debris special investigation group; status of 3-D crater analysis from binocular imagery p 3192 N92-27251

Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252

Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254

Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257

Interplanetary meteoroid debris in LDEF metal craters p 3193 N92-27258

SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2 p 3193 N92-27259

Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets p 3193 N92-27261

Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces p 3193 N92-27264

Modelling the near-Earth space environment using LDEF data p 3128 N92-27265

Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328

SPACE ERECTABLE STRUCTURES

Development of a truss joint for robotic assembly of space structures
[NASA-TP-3214] p 3117 N92-27974

SPACE FLIGHT STRESS

Metabolic energy requirements for space flight
[NASA-TM-107933] p 3138 N92-28212

SPACE PLASMAS

Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594

SPACE PLATFORMS

Detailed examination of LDEF's frame and the A0178 thermal blankets by the meteoroid and debris special investigations group p 3192 N92-27244

On the stability of a dual spin satellite with asymmetric rotor and flexible platform
[ISBN-0-315-54650-6] p 3056 N92-27613

Dynamics and control of an orbiting space platform based tethered satellite system
[ISBN-0-315-56001-0] p 3056 N92-27646

SPACE PROBES

Project UM-HAUL (UnManned Heavy pAyload Unloader and Lander): The design of a reusable lunar lander with an independent cargo unloader
[NASA-CR-189971] p 3054 N92-27540

Conference on Combined Effects: Radiation, Microg ravity, Trauma, and other Factors
[AD-A247799] p 3065 N92-27862

SPACE PROGRAMS

Retrievable payload carrier. Next generation Long Duration Exposure Facility: Update 1992 p 3066 N92-27325

An educational space seminar to increase American student interest in space careers
[AD-A246565] p 3179 N92-27499

SPACE SHUTTLE PAYLOADS

Retrievable payload carrier. Next generation Long Duration Exposure Facility: Update 1992 p 3066 N92-27325

SPACE SHUTTLES

RMS active damping augmentation p 3155 N92-27771

SPACE STATION FREEDOM

EVA robotics for Space Station Freedom: Dextrous Manipulator Development (DEMAND) p 3155 N92-27765

IVA robotics for Space Station Freedom p 3155 N92-27766

Hand controller study of force and control mode p 3155 N92-27767

Analysis and testing of a space crane articulating joint testbed p 3156 N92-27773

Space Station: Contract oversight and performance provisions for major work packages. Briefing report to the Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space and Technology, House of Representatives
[GAO/NSIAD-92-171BR] p 3182 N92-27928

User assembly and servicing system for Space Station, an evolving architecture approach
[NASA-TM-107942] p 3066 N92-28213

SPACE STATION STRUCTURES

Antenna pointing system mounted on a flexible space structure
[NAL-TR-1119] p 3110 N92-27432

SPACE STATIONS

The Canadian Space Agency, Space Station, Strategic Technologies for Automation and Robotics Program technology development activity in protection of materials from the low Earth orbit space environment p 3053 N92-27327

RMS active damping augmentation p 3155 N92-27771

SPACE TRANSPORTATION SYSTEM

Bivariate extreme value distributions
[NASA-CR-4444] p 3159 N92-27588

SPACE WEAPONS

Some advances in US space defense systems
[AD-A246038] p 3160 N92-27658

SPACEBORNE EXPERIMENTS

Second LDEF Post-Retrieval Symposium abstracts
[NASA-CP-10097] p 3196 N92-27218

Heavy Ions In Space (HIIS) experiment p 3165 N92-27240

Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247

Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248

Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252

Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment p 3192 N92-27253

Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254

Interplanetary meteoroid debris in LDEF metal craters p 3193 N92-27258

Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces p 3193 N92-27264

The interstellar gas experiment: Analysis in progress p 3145 N92-27266

Follow up on the crystal growth experiments of the LDEF p 3178 N92-27268

LDEF materials overview p 3068 N92-27269

LDEF materials data analysis: Representative examples p 3078 N92-27272

Long Duration Exposure Facility experiment M0003 deintegration observation database p 3078 N92-27273

Overview of the systems special investigation — long duration exposure facility p 3079 N92-27303

New results from FRECOPA analysis — long duration exposure facility p 3111 N92-27304

Degradation of electro-optic components aboard LDEF — long duration exposure facility p 3170 N92-27306

LDEF space optics handbook — long duration exposure facility p 3171 N92-27311

Final results of the Space Exposed Experiment Developed for Students (SEEDS) P-0004-2 p 3136 N92-27322

Continued results of the seeds in space experiment p 3136 N92-27323

Retrievable payload carrier. Next generation Long Duration Exposure Facility: Update 1992 p 3066 N92-27325

Next generation optical instruments and space experiments based on the LDEF thermal control surfaces experiment (S0069) p 3171 N92-27326

Hand controller study of force and control mode p 3155 N92-27767

New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876

SPACEBORNE TELESCOPES

Multi-use lunar telescopes
[NASA-TM-107908] p 3189 N92-27651

SPACECRAFT COMPONENTS

Radiation model predictions and validation using LDEF data p 3165 N92-27237

SPACECRAFT CONSTRUCTION MATERIALS

The effect of jet fuel exposure on advanced aerospace composites. Part 1: Thermal and chemical analysis
[AD-A246559] p 3068 N92-27531

SPACECRAFT CONTAMINATION

Contamination measurements on experiment M0003 p 3073 N92-27298

SPACECRAFT CONTROL

Development of an active damping system to aid in the attitude control of flexible spacecraft
[AD-A246248] p 3050 N92-27200

Dynamics and control of an orbiting space platform based tethered satellite system
[ISBN-0-315-56001-0] p 3056 N92-27646

Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722

Robust intelligent flight control for hypersonic vehicles
[NASA-CR-185680] p 3051 N92-28209

Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210

SPACECRAFT DESIGN

Spacecraft design project multipurpose satellite bus MPS
[NASA-CR-190009] p 3055 N92-27555

System requirements specification for SMART structures mode p 3149 N92-27830

Surface generation and editing operations applied to structural support of aerospace vehicle fuselages p 3149 N92-27831

SPACECRAFT ENVIRONMENTS

Spacecraft thermal control coatings: Comparison between flight results obtained on LDEF and MIR p 3079 N92-27300

SPACECRAFT EQUIPMENT

Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004

SPACECRAFT INSTRUMENTS

Gamma astronomy satellite p 3053 N92-27932

SPACECRAFT MANEUVERS

Performance analysis of non-coplanar synergetic maneuvers
[AD-A246576] p 3054 N92-27534

SPACECRAFT POWER SUPPLIES

Spacecraft design project multipurpose satellite bus MPS
[NASA-CR-190009] p 3055 N92-27555

Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update
[NASA-TM-105689] p 3067 N92-27878

SPACECRAFT PROPULSION

Magnetic bearings: A key technology for advanced rocket engines? p 3057 N92-27725

SPACECRAFT RADIATORS

The use of electrical transmission line theory to predict the performance of spacecraft radiators
[AD-A247786] p 3091 N92-27861

SPACECRAFT SHIELDING

Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets p 3193 N92-27261

SPACECRAFT STABILITY

On the stability of a dual spin satellite with asymmetric rotor and flexible platform
[ISBN-0-315-54650-6] p 3056 N92-27613

Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722

SPACECRAFT STRUCTURES

Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces p 3193 N92-27264

Analysis and testing of a space crane articulating joint testbed p 3156 N92-27773

SPALLATION

Cosmogenic radioisotopes on LDEF surfaces p 3165 N92-27239

SPANWISE BLOWING

Heat transfer, adiabatic effectiveness and injectant distributions downstream of single and double rows of film-cooling holes with compound angles
[AD-A246531] p 3101 N92-27529

SPARKS

Explosives simulants
[DE92-011074] p 3080 N92-27418

SPATIAL DISTRIBUTION

Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916

SPECIFIC HEAT

Users manual and modeling improvements for axial turbine design and performance computer code TD2-2
[NASA-CR-189118] p 3035 N92-27376

SPECIFICATIONS

Equations for approximate lower confidence limits on process capability indices
[AD-A247591] p 3159 N92-27568

Relative utility of selected software requirement metrics
[AD-A246749] p 3152 N92-28106

Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210

SPECTRAL LINE WIDTH
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085

SPECTRAL REFLECTANCE
Spectral infrared hemispherical reflectance measurements for LDEF tray clamps
p 3170 N92-27295
Next generation optical instruments and space experiments based on the LDEF thermal control surfaces experiment (S0069) p 3171 N92-27326

SPECTROMETERS
VLA, PHOENIX and BATSE observations of an X1 flare
[AD-A248461] p 3194 N92-27935

SPECTROSCOPY
A design, fabrication and test of a precision positioning servo drive for a multiplexed imaging system
[AD-A246507] p 3106 N92-27630
Vibrational spectroscopic studies of surface chemical interactions in chemisorption and catalysis
[DE92-011189] p 3072 N92-28046
Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region
[AD-A248612] p 3072 N92-28064

SPECTRUM ANALYSIS
Optically stable, large time bandwidth acousto-optic heterodyne spectrum analyzer with fixed non-zero heterodyne output
[AD-D015223] p 3163 N92-27998

SPHERES
Development of voids in the thin-wall approximation
[ISBN-0-315-60772-6] p 3191 N92-27689

SPIN RESONANCE
An ESR study of the UV degradation of FEP
p 3079 N92-27287

SPIN STABILIZATION
On the stability of a dual spin satellite with asymmetric rotor and flexible platform
[ISBN-0-315-54650-6] p 3056 N92-27613
Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210

SPIRAL GALAXIES
Autogravity waves in a polytropic layer
p 3195 N92-27635
Self-similar spiral structure in astrophysical disks
[ISBN-0-315-61539-7] p 3191 N92-27701

SPLINES
An investigation of multivariate adaptive regression splines for modeling and analysis of univariate and semi-multivariate time series systems
[AD-A246155] p 3159 N92-27578

SPOILERS
Note on flight measured control effectiveness of the quiet STOL experimental aircraft ASKA
[NAL-TR-1103] p 3051 N92-28154

SPRAYED COATINGS
Plasma spray technology process parameters and applications
[DE92-620035] p 3078 N92-28159

SPRAYERS
Fundamental studies on droplet interactions in dense sprays
[AD-A246918] p 3101 N92-27546
Plasma spray technology process parameters and applications
[DE92-620035] p 3078 N92-28159

SPREAD SPECTRUM TRANSMISSION
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785

STABILITY
Stability and reactivity of dimethylethoxysilane
p 3073 N92-27286
LEO effects on candidate solar cell cover materials
p 3124 N92-27321
Environmentally stable metal powders --- gas atomization process
[AD-D015222] p 3074 N92-27619
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream
p 3039 N92-27946
Optically stable, large time bandwidth acousto-optic heterodyne spectrum analyzer with fixed non-zero heterodyne output
[AD-D015223] p 3163 N92-27998

STABILITY AUGMENTATION
Flight-determined benefits of integrated flight-propulsion control systems
[NASA-TM-4393] p 3048 N92-27587

STABILITY DERIVATIVES
A review of scale effects on surfaces in unsteady motion p 3042 N92-27962

STANDARDIZATION
DoD implementation guidelines for Electronic Data Interchange (EDI), volume 1
[AD-A246613] p 3184 N92-27536
Development of a standard anthropometric dimension set for use in computer-aided glove design
[AD-A246272] p 3143 N92-27664
Core avionics and standardization
[AD-A248326] p 3047 N92-27925
Avionic data bus integration technology
[DOT/FAA/CT-91/19] p 3047 N92-27973

STANDARDS
Implementation notes on bdes(1) --- data encryption implementation
[NASA-CR-190442] p 3147 N92-27560
Technology and standards for a common air mission planner p 3033 N92-27899

STANDING WAVES
Experimental investigation of energy dissipation in finite-amplitude standing waves
[AD-A246428] p 3109 N92-27203

STAR FORMATION
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640
Turbulent cooling flows in galaxies and clusters
[ISBN-0-315-61634-2] p 3191 N92-27699

STAR TRACKERS
Visual photometric experiment data processing system
[AD-A248657] p 3044 N92-27964

STARS
Visual photometric experiment data processing system
[AD-A248657] p 3044 N92-27964

STATIC STABILITY
Flight testing of a half-scale remotely piloted vehicle
[AD-A248568] p 3046 N92-28123

STATIC TESTS
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C
[AD-A246407] p 3069 N92-27752

STATISTICAL ANALYSIS
Visit to CALTECH and CERRA/ICASP6 reliability conference
[AD-A246432] p 3159 N92-27205
Combination of probabilities in looking for cosmic ray sources
[DE92-010350] p 3195 N92-27390
HippoDraw and Hippoplotamus
[DE92-010744] p 3146 N92-27414
Measuring uncertainty by extracting fuzzy rules using rough sets and extracting fuzzy rules under uncertainty and measuring definability using rough sets
[NASA-CR-190394] p 3148 N92-27585
Exponential error bounds on codes for noisy channels with inaccurately known statistics and for generalized decision rules
[AD-A246064] p 3158 N92-27834
Gradient estimation for ratios
[AD-A248453] p 3160 N92-28140
Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144
Statistical process control techniques for the telecommunications systems manager
[AD-A249122] p 3183 N92-28172

STATISTICAL DISTRIBUTIONS
Theory and application of random fields
[AD-A246958] p 3159 N92-27334
Performance parameter methodology update for information delivery times
[AD-A248897] p 3185 N92-27997

STATORS
Characterization of superconducting magnetic bearings (dynamic stiffness and damping coefficient in axial direction) p 3059 N92-27737

STEADY FLOW
Steady and unsteady 3D flow computation through a transonic turbine stage p 3050 N92-27469
Unstructured grid methods for compressible flows
p 3103 N92-27676

STEADY STATE
Wave-wave interactions in a steady-state stratospheric model, part 1
[CRG-89-5-PT-1] p 3126 N92-27355
Numerical investigations of breather solitons in nonlinear vibratory lattices
[AD-A246524] p 3178 N92-27527
Investigation of an argon-filled thermoacoustic prime mover
[AD-A246751] p 3179 N92-28107
Conditions for the applicability of the regenerative method
[AD-A248598] p 3160 N92-28182
Wave-wave interactions in a steady-state stratospheric model, part 2
[CRG-89-6-PT-2] p 3128 N92-28201

STEAM TURBINES
A simplified nonlinear model for a Combined Heat and Power (CHP) system
[RR-416] p 3081 N92-27926

STEELS
A study of the microstructural basis for the strength and toughness properties of overaged HSLA-100 steel
[AD-A246955] p 3073 N92-27332
Tribological behavior of oil-lubricated, TiN-coated steel
[DE92-010500] p 3110 N92-27410
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139

STELLAR GRAVITATION
Gravitational clustering of galaxies: Distribution of galaxy counts in cells
[ISBN-0-315-59910-3] p 3190 N92-27687

STELLAR LUMINOSITY
Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147

STELLAR MOTIONS
Topics in galactic dynamics
[ISBN-0-315-47774-1] p 3190 N92-27611

STELLAR OSCILLATIONS
The incidence and nature of absorption line profile variations among the O stars
[ISBN-0-315-56945-X] p 3189 N92-27684

STELLAR SPECTRA
Identification and study of HII regions in the IRAS point source catalog
[ISBN-0-315-61537-0] p 3189 N92-27700

STELLARATORS
Computational methods for stellerator configurations
[DE92-011131] p 3174 N92-28057

STEPPING MOTORS
Magnetostrictive direct drive motors
[NASA-CR-190451] p 3089 N92-27404

STIMULATED EMISSION
Proof of the feasibility of coherent and incoherent schemes for pumping a gamma ray laser
[AD-A245372] p 3107 N92-27438

STIRLING CYCLE
Heavy duty transport research needs assessment
[DE92-010622] p 3109 N92-27394
An investigation of the information propagation and entropy transport aspects of Stirling machine numerical simulation
[NASA-CR-189143] p 3105 N92-27975

STOCHASTIC PROCESSES
Theory and application of random fields
[AD-A246958] p 3159 N92-27334
Framework optimization using stochastic gradient process
[ETN-92-90828] p 3159 N92-27406
Chaotic and random responses of ocean structural systems
[AD-A247561] p 3134 N92-27583
Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661
Extended H2 synthesis for multiple degree-of-freedom controllers p 3059 N92-27741
Development of the microstructure based stochastic life prediction models
[AD-A246447] p 3074 N92-27821

STOKES LAW (FLUID MECHANICS)
Turbine internal fluid flow analysis and Stokes' hypothesis p 3095 N92-27455

STORABLE PROPELLANTS
Advanced materials for turbomachinery. Technical memo number 2: Advanced materials compatibility with storable propellants (monomethyl hydrazine and nitrogen tetroxide)
[AD-A246725] p 3080 N92-28070

STORAGE BATTERIES
DC uninterrupted power supply having instantaneous switching followed by low impedance switching
[AD-D015206] p 3089 N92-27398
Lithium rechargeable cell with a polymer cathode
[AD-A247577] p 3090 N92-27567

STORM SUPPRESSION
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655

STORMS (METEOROLOGY)
Dust and sand forecasting in Iraq and adjoining countries
[AD-A247588] p 3129 N92-27551

STRAIN GAGES
Thermal expansion behavior of LDEF metal matrix composites p 3070 N92-27294
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[UTIAS-337] p 3116 N92-27633

Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[ISBN-0-315-59931-6] p 3117 N92-28158

STRAIN HARDENING
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178

STRAIN MEASUREMENT
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[UTIAS-337] p 3116 N92-27633
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[ISBN-0-315-59931-6] p 3117 N92-28158

STRAIN RATE
Processing, microstructure and superplasticity in Al-Mg-Mn alloys
[AD-A246488] p 3073 N92-27207
The viscoelastic characterization of polymer materials exposed to the low-Earth orbit environment
p 3079 N92-27283
Investigation of the rate-controlling mechanism(s) for high temperature creep and the relationship between creep and melting by use of high pressure as a variable
[DE92-011058] p 3074 N92-27416
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178

STRAPS
LDEF microenvironments, observed and predicted
p 3066 N92-27220

STRATOCUMULUS CLOUDS
CCN spectra measurements as an active tracer of stratocumulus mechanisms --- cloud condensation nuclei
[AD-A246499] p 3129 N92-27668

STRATOSPHERE
Wave-wave interactions in a steady-state stratospheric model, part 1
[CRG-89-5-PT-1] p 3126 N92-27355
Wave-wave interactions in a steady-state stratospheric model, part 2
[CRG-89-6-PT-2] p 3128 N92-28201

STREAMS
Experimental study of cross-stream mixing in a rectangular duct
[NASA-TM-105694] p 3049 N92-27652

STRESS (PHYSIOLOGY)
Stress-induced enhancement of the startle reflex
[AD-A247096] p 3140 N92-27839
Ergonomics manual
[AD-A246934] p 3143 N92-28071
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094

STRESS ANALYSIS
Fatigue life improvement of an autofrettage thick-walled pressure vessel with an external groove
[AD-A247233] p 3115 N92-27213
Structural analysis of thermal fatigue failures on rocket combustion chambers by the finite element method
[NAL-TR-1117] p 3067 N92-27430
An analysis of the Stress Wave In Solids (SWIS) finite element code
[AD-A245921] p 3115 N92-27573
Estimation of cable-mounted model inertia characteristics for dynamic wind-tunnel test
[NAL-TM-641] p 3042 N92-28152

STRESS DISTRIBUTION
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627

STRESS INTENSITY FACTORS
Cracks on or near an interface p 3116 N92-27643

STRESS RELAXATION
Experimental investigation of turbulence behavior in shock wave/turbulent boundary layer interactions
[AD-A247792] p 3104 N92-27886

STRESS RELIEVING
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627

STRESS WAVES
An analysis of the Stress Wave In Solids (SWIS) finite element code
[AD-A245921] p 3115 N92-27573

STRESSES
Geotechnical centrifuge use at University of Cambridge Geotechnical Centre, August-September 1991
[AD-A246490] p 3126 N92-27209
Experimental investigation of turbulence behavior in shock wave/turbulent boundary layer interactions
[AD-A247792] p 3104 N92-27886
Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318
[DE92-009408] p 3117 N92-28041

STRONG INTERACTIONS (FIELD THEORY)
The Cornwall-Norton model in the strong coupling regime
[DE92-621061] p 3164 N92-27498

STRUCTURAL ANALYSIS
Geometric modeling for computer aided design
[NASA-CR-190363] p 3149 N92-27829
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages
p 3149 N92-27831
Application driven interface generation for EASIE
p 3145 N92-27832
Explicit solution of difference equation for the wavenumber response of fluid-loaded stiffened plate
[AD-A247922] p 3116 N92-27850
Glass sample preparation and performance investigations --- solar x-ray imager
[NASA-CR-190399] p 3169 N92-27871
Engine structures modeling software system: Computer code. User's manual
[NASA-CR-189154] p 3116 N92-27872
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems
[NASA-CR-186516] p 3116 N92-27874
Unsteady aerodynamics for aeroelasticity at the Flight Dynamics Directorate p 3038 N92-27939

STRUCTURAL BASINS
Monitoring of global acoustic transmissions: Signal processing and preliminary data analysis
[AD-A246572] p 3162 N92-27532
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert
p 3088 N92-28025

STRUCTURAL DESIGN
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages
p 3149 N92-27831
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems
[NASA-CR-186516] p 3116 N92-27874
A preliminary study on damage detection using piezoelectric film
[AD-A246350] p 3046 N92-28118

STRUCTURAL ENGINEERING
Visit to CALTECH and CERRA/ICASP6 reliability conference
[AD-A246432] p 3159 N92-27205
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 11: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248774] p 3219 N92-28098
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 7: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248770] p 3219 N92-28110

STRUCTURAL STRAIN
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[UTIAS-337] p 3116 N92-27633
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[ISBN-0-315-59931-6] p 3117 N92-28158

STRUCTURAL VIBRATION
Ground vibration tests of a high fidelity truss for verification of on orbit damage location techniques
[NASA-TM-107626] p 3115 N92-27375
Optimal control of large space structures using distributed gyricity: A continuum approach
[ISBN-0-315-56953-0] p 3056 N92-27612
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
AFRAPT Program at Texas A and M University research for advanced aircraft engine structures
[AD-A247040] p 3049 N92-28076

STUDENTS
Final results of the Space Exposed Experiment Developed for Students (SEEDS) P-0004-2
p 3136 N92-27322
An educational space seminar to increase American student interest in space careers
[AD-A246565] p 3179 N92-27499
AFRAPT Program at Texas A and M University research for advanced aircraft engine structures
[AD-A247040] p 3049 N92-28076

SUBSONIC FLOW
Unsteady Euler calculations in 3D internal aerodynamics p 3098 N92-27470
Validation of non-orthogonal three-dimensional laminar flow predictions p 3098 N92-27476

SUBSONIC SPEED
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711
Present status of the MIT/NASA Langley 6-inch MSBS p 3053 N92-27802

SUBSONIC WIND TUNNELS
Effect of collector configuration on test section turbulence levels in an open-jet wind tunnel
[NASA-TM-4333] p 3051 N92-27670

SUBSTRATES
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging
[AD-A246429] p 3088 N92-27204
Low capacitance field emitter array and method of manufacture therefor
[AD-D015225] p 3092 N92-28000
Plasma spray technology process parameters and applications
[DE92-620035] p 3078 N92-28159
An XPS study of the formation of thin Pt and Ir silicide overlayers on Si (100) 2 x 1 surfaces
[AD-A245929] p 3178 N92-28165

SULFUR DIOXIDES
Emissions trading and compliance: Regulatory incentives and barriers
[DE92-010280] p 3125 N92-27571

SUN
VLA, PHOENIX and BATSE observations of an X1 flare
[AD-A248461] p 3194 N92-27935
Identification of driver gas-associated Bz events and prediction of their orientation
[AD-A248480] p 3194 N92-28059

SUPERCOMPUTERS
Finite element methods in CFD: Grid generation, adaptivity, and parallelization p 3103 N92-27679
Massively parallel computing, C++, and hydrocode algorithms
[DE92-006739] p 3154 N92-27748

SUPERCONDUCTING FILMS
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409
Magnetic suspension using high temperature superconducting cores p 3061 N92-27789
High performance YBCO films
[AD-A246802] p 3093 N92-28130

SUPERCONDUCTING MAGNETS
International Symposium on Magnetic Suspension Technology, part 1
[NASA-CP-3152-PT-1] p 3056 N92-27721
Large-gap magnetic suspension systems
p 3057 N92-27724
Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Characterization of superconducting magnetic bearings (dynamic stiffness and damping coefficient in axial direction) p 3059 N92-27737
International Symposium on Magnetic Suspension Technology, part 2
[NASA-CP-3152-PT-2] p 3061 N92-27788
Change in the coil distribution of electrodynamic suspension system p 3064 N92-27806
Battery cars on superconducting magnetically levitated carriers: One commuting solution p 3065 N92-27811
Computation of magnetic suspension of maglev systems using dynamic circuit theory p 3065 N92-27813
Performance of a superconducting large-angle magnetic suspension p 3065 N92-27815

SUPERCONDUCTIVITY
Characterization of superconducting magnetic bearings (dynamic stiffness and damping coefficient in axial direction) p 3059 N92-27737
International Symposium on Magnetic Suspension Technology, part 2
[NASA-CP-3152-PT-2] p 3061 N92-27788
Cryogenic test rig with an aerodynamic magnetically levitated carriage p 3052 N92-27792
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012

Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials
[AD-A248736] p 3078 N92-28126

SUPERCONDUCTORS
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966

SUPERCRITICAL AIRFOILS
Comparison of Euler and full potential methods for unsteady transonic flow calculations
p 3038 N92-27943

SUPERGIANT STARS
The incidence and nature of absorption line profile variations among the O stars
[ISBN-0-315-56945-X] p 3189 N92-27684

SUPERLATTICES
Theory of semiconducting superlattices and microstructures
[AD-A248681] p 3092 N92-27965

SUPERSONIC COMBUSTION RAMJET ENGINES
An investigation into the performance characteristics of a solid fuel SCRAMJET propulsion device
[AD-A246486] p 3048 N92-27206

SUPERSONIC FLOW
Nonequilibrium 3D flows of air through inlets
p 3100 N92-27487
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle p 3052 N92-27977

SUPERSONIC INLETS
A fast, uncoupled, compressible, two-dimensional, unsteady boundary layer algorithm with separation for engine inlets
[NASA-TM-105686] p 3102 N92-27653

SUPERSONIC TURBINES
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row
p 3050 N92-27466
Steady and unsteady 3D flow computation through a transonic turbine stage p 3050 N92-27469

SUPERSONIC WIND TUNNELS
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle
[NASA-CR-188055] p 3052 N92-27976
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle p 3052 N92-27977
The FML compressor as a drive system for the LFSWT: A narrative p 3052 N92-27978

SUPPORT SYSTEMS
A conceptual design for the Telecommunications Emergency Decision Support System (TEDSS)
[AD-A246045] p 3083 N92-27660
Designing a graphical user interface for a bilateral negotiation support system
[AD-A247910] p 3150 N92-27848

SURFACE CRACKS
A preliminary study on damage detection using piezoelectric film
[AD-A246350] p 3046 N92-28118

SURFACE DIFFUSION
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120

SURFACE FINISHING
Plasma spray technology process parameters and applications
[DE92-620035] p 3078 N92-28159

SURFACE LAYERS
Solid state research
[AD-A247338] p 3176 N92-27216
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122

SURFACE PROPERTIES
LDEF microenvironments, observed and predicted
p 3066 N92-27220
The structure and reactivity of boron surfaces
[AD-A247265] p 3071 N92-27510
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan
p 3119 N92-28017
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122

SURFACE REACTIONS
Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292
The structure and reactivity of boron surfaces
[AD-A247265] p 3071 N92-27510
Vibrational spectroscopic studies of surface chemical interactions in chemisorption and catalysis
[DE92-011189] p 3072 N92-28046
Kinetics of surface reactions studied by laser desorption with FTMS detection
[AD-A248412] p 3109 N92-28051

SURFACE ROUGHNESS
A new composite roughness surface scattering model
[AD-A248891] p 3085 N92-27970

SURFACE VEHICLES
Comparison of the event-step algorithm to other path planning methods to avoid dynamic 3D obstacles
p 3033 N92-27896

SURFACE WATER
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666

SURFACE WAVES
Determination of shear wave velocity structure in the Rio Grande rift through receiver function and surface wave analysis, appendix B
[AD-A246937] p 3128 N92-28072
Acoustic sensing of ocean turbulence
[AD-A246752] p 3136 N92-28108

SURGES
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007

SURVEYS
NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397
Review of climatic fluctuations on the century timescale
[CGCR-89-7] p 3124 N92-27426
Profile of an effective engineering manager
[AD-A246525] p 3180 N92-27528
Highlights of total quality management in the Department of Defense: Lessons learned, quality measurements, and innovative practices
[AD-A246167] p 3114 N92-27602
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 3: The impact of a sponsor letter on mail survey response rates
[NASA-TM-107923] p 3185 N92-28112
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 17: The relationship between seven variables and the use of US government technical reports by US aerospace engineers and scientists
[NASA-TM-107950] p 3186 N92-28115
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 15: Technical communications in the international workplace: Some implications for curriculum development
[NASA-TM-107926] p 3186 N92-28116
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 20: Engineers as information processors: A survey of US aerospace engineering faculty and students
[NASA-TM-107928] p 3186 N92-28155

SUSPENSION SYSTEMS (VEHICLES)
Attractive and repulsive magnetic suspension systems overview p 3064 N92-27805

SWEPT FORWARD WINGS
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956

SWEPT WINGS
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711
Comparison of Euler and full potential methods for unsteady transonic flow calculations
p 3038 N92-27943

SWITCHES
Monolithic integration of semiconductor and superconductor components
[AD-A248952] p 3092 N92-28067

SWITCHING
Parasitic free switched capacitor composite operational amplifiers
[AD-A246258] p 3093 N92-28167
A communications model for an ISAS to NASA span link
[NASA-TM-107936] p 3088 N92-28187

SWITCHING CIRCUITS
DC uninterrupted power supply having instantaneous switching followed by low impedance switching
[AD-D015206] p 3089 N92-27398

SYMBOLIC PROGRAMMING
Implementation of parallel algorithms
[AD-A248759] p 3150 N92-27995

SYMMETRY
Solutions of Einstein's equations having functionally separable metrics
[ISBN-0-315-60751-3] p 3179 N92-27688

SYNAPSES
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989

SYNCHRONISM
A formal model of asynchronous communication and its use in mechanically verifying a biphase mark protocol
[NASA-CR-4433] p 3153 N92-27586
Experimental validation of clock synchronization algorithms
[NASA-TP-3209] p 3153 N92-27589
Fault tolerant real-time systems
[AD-A246644] p 3154 N92-27755
INMARSAT communications system: A systems approach
[AD-A246820] p 3087 N92-28134

SYNCHROTRONS
Amplification and damping of synchrotron oscillations via a parametric process
[DE92-010748] p 3166 N92-28174

SYNOPTIC METEOROLOGY
Modeling and observational studies of mesoscale air-mass boundaries and warm-season convective precipitation
[AD-A247030] p 3128 N92-27336
Coastally trapped disturbances in the lower atmosphere
[ISBN-0-315-55186-0] p 3129 N92-27622
Persistent circulation anomalies in observations and in a general circulation model
[ISBN-0-315-57198-5] p 3127 N92-27642

SYNTHESIS (CHEMISTRY)
Macrocycles containing tin
[AD-A246866] p 3163 N92-27351

SYNTHETIC APERTURE RADAR
Project MEDSAT: The design of a remote sensing platform for malaria research and control
[NASA-CR-190008] p 3055 N92-27541
Classification of SAR ship images with the aid of a syntactic pattern recognition algorithm
[DREO-TN-91-10] p 3084 N92-27695
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop
[NASA-CR-190461] p 3119 N92-28013
Progress towards SAR based ecosystem analysis
p 3119 N92-28014
The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery
p 3119 N92-28015
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan
p 3119 N92-28017
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019
Soil moisture measurements from airborne SAR
p 3120 N92-28020
Snow and glacier mapping with polarimetric SAR
p 3120 N92-28021
Monsoon 1990: Preliminary SAR results
p 3120 N92-28022
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023
Dual frequency along-track interferometry
p 3088 N92-28024
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert
p 3088 N92-28025
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada
p 3121 N92-28027
MAESTRO1 data set calibration: The JRC approach
p 3122 N92-28028
SAR calibration and principal component analysis
p 3088 N92-28029
Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030
External calibration of polarimetric radars using point and distributed targets p 3088 N92-28031
Calibration of a polarimetric imaging SAR
p 3088 N92-28032
Information content of polarimetric SAR data
p 3088 N92-28033
The AIRSAR image browse system
p 3088 N92-28034

Geometric rectification and geocoding of JPL's AIRSAR data over hilly terrain p 3088 N92-28035
Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038

SYSTEM FAILURES
Approximate confidence limit procedures for complex systems
[AD-A247253] p 3159 N92-27384

SYSTEMS ANALYSIS
Overview of the systems special investigation — long duration exposure facility p 3079 N92-27303
Fuzzy guidance system evaluation p 3034 N92-27903

SYSTEMS COMPATIBILITY
Local Area Network (LAN) compatibility issues
[AD-A247249] p 3153 N92-27212

SYSTEMS ENGINEERING
A teamwork model of pilot aiding: Psychological principles for mission management systems design p 3032 N92-27893
ICAAS piloted simulation evaluation p 3034 N92-27906
Advanced systems engineering and network planning support
[NASA-CR-189274] p 3182 N92-27972

SYSTEMS INTEGRATION
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784

SYSTEMS MANAGEMENT
Statistical process control techniques for the telecommunications systems manager
[AD-A249122] p 3183 N92-28172

SYSTEMS SIMULATION
A simplified nonlinear model for a Combined Heat and Power (CHP) system
[RR-416] p 3081 N92-27926

SYSTEMS STABILITY
Stability and performance of notch filter control for unbalance response p 3058 N92-27731
Design of bearings for rotor systems based on stability p 3063 N92-27799

T

TACAN
JTIDS electromagnetic compatibility in the 960-1215 MHz band
[AD-A247834] p 3085 N92-27864

TACTICS
Interdiction mission planning and co-ordination during the Gulf conflict 17 January - 27 February 1991 p 3031 N92-27888
Situation assessment in the Paladin tactical decision generation system p 3032 N92-27892

TANKS (COMBAT VEHICLES)
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990

TARGET ACQUISITION
Management of the fleet satellite communications satellite acquisition for the Naval Postgraduate School
[AD-A246969] p 3082 N92-27400
Effects of color vision deficiency on detection of color-highlighted targets in a simulated air traffic control display
[AD-A246586] p 3139 N92-27500
Laser radar system demonstration: System requirements review, second demonstration receiver
[AD-A246159] p 3108 N92-27601
Integrated multi-domain radar demonstration
[AD-A246653] p 3084 N92-27758
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles p 3031 N92-27890

TARGETS
Angular distributions of 5eV atomic oxygen scattered from solid surfaces on the LDEF satellite p 3165 N92-27301
Airpower planning and battle management training at airbase level p 3031 N92-27889
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles p 3031 N92-27890
Search route planning p 3033 N92-27900
Optimal guidance anticipating missile performance p 3034 N92-27902
Visual attention and perception in three-dimensional space
[AD-A247823] p 3141 N92-27910

TASK COMPLEXITY
Attentional demands and effects of extended practice in a one-finger key-pressing task
[AD-A245384] p 3138 N92-27444
Dual-task performance as a function of presentation mode and individual differences in verbal and spatial ability
[AD-A246611] p 3139 N92-27535

TASKS
Attentional demands and effects of extended practice in a one-finger key-pressing task
[AD-A245384] p 3138 N92-27444
Dual-task performance as a function of presentation mode and individual differences in verbal and spatial ability
[AD-A246611] p 3139 N92-27535

TAXONOMY
Research into the development of a knowledge acquisition taxonomy
[NASA-CR-189939] p 3152 N92-28150

TDR SATELLITES
Communication analysis for the expendable explorer spacecraft
[NASA-CR-189273] p 3083 N92-27516
Advanced systems engineering and network planning support
[NASA-CR-189274] p 3182 N92-27972
Optical Terminal Definition for the Future Service Growth (FSG) module of the Advanced Tracking and Data Relay Satellite (ATDRSS)
[NASA-CR-189270] p 3055 N92-28219

TECHNICAL WRITING
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 21: Technological innovation and technical communications: Their place in aerospace engineering curricula. A survey of European, Japanese, and US Aerospace Engineers and Scientists
[NASA-TM-107929] p 3187 N92-28184

TECHNOLOGIES
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 15: Technical communications in the international workplace: Some implications for curriculum development
[NASA-TM-107926] p 3186 N92-28116
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222

TECHNOLOGY ASSESSMENT
The Canadian Space Agency, Space Station, Strategic Technologies for Automation and Robotics Program technology development activity in protection of materials from the low Earth orbit space environment p 3053 N92-27327
Ceramic composites: Enabling aerospace materials
[NASA-TM-105599] p 3076 N92-27378
STAR 21: Strategic technologies for the Army of the twenty-first century
[REPT-92-8945] p 3160 N92-27423
Feasibility of magnetic bearings for advanced gas turbine engines p 3059 N92-27738
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784
PDES Application Protocol Suite for Composites (PAS-C): State-Of-The-Art (SOTA) assessment for the PAS-C program
[AD-A247921] p 3089 N92-27849
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870
Optical fiber sensors p 3086 N92-28090
Smart structures: The relevance of fibre optics p 3086 N92-28091
Fiber-optic gyroscope p 3087 N92-28092
Fiber optic data busses for aircraft p 3048 N92-28093
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222

TECHNOLOGY TRANSFER
NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 8: The role of the information intermediary in the diffusion of aerospace knowledge
[NASA-TM-107949] p 3185 N92-28113
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 13: The information-seeking habits and practices of engineers
[NASA-TM-107931] p 3185 N92-28114
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 17: The relationship between seven variables and the use of US government technical reports by US aerospace engineers and scientists
[NASA-TM-107950] p 3186 N92-28115
SPAN: Astronomy and astrophysics
[NASA-TM-107940] p 3192 N92-28185
SPAN: Ocean science
[NASA-TM-107939] p 3187 N92-28186
A communications model for an ISAS to NASA span link
[NASA-TM-107936] p 3088 N92-28187

TECHNOLOGY UTILIZATION
Ceramic composites: Enabling aerospace materials
[NASA-TM-105599] p 3076 N92-27378
NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397
STAR 21: Strategic technologies for the Army of the twenty-first century
[REPT-92-8945] p 3160 N92-27423
Control concepts for active magnetic bearings p 3060 N92-27743
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 20: Engineers as information processors: A survey of US aerospace engineering faculty and students
[NASA-TM-107928] p 3186 N92-28155
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 21: Technological innovation and technical communications: Their place in aerospace engineering curricula. A survey of European, Japanese, and US Aerospace Engineers and Scientists
[NASA-TM-107929] p 3187 N92-28184

TEFLON (TRADEMARK)
LDEF materials data analysis: Representative examples p 3078 N92-27272
LDEF thermal control coatings post-flight analysis p 3078 N92-27276

TELECOMMUNICATION
A conceptual design for the Telecommunications Emergency Decision Support System (TEDSS)
[AD-A246045] p 3083 N92-27660
Advances in Fibre-Optic Technology in Communications and for Guidance and Control
[AGARD-LS-184] p 3086 N92-28084
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085
INMARSAT communications system: A systems approach
[AD-A246820] p 3087 N92-28134
Statistical process control techniques for the telecommunications systems manager
[AD-A249122] p 3183 N92-28172

TELEMETRY
Flight testing of a half-scale remotely piloted vehicle
[AD-A248568] p 3046 N92-28123

TELEOPERATORS
Hand controller study of force and control mode p 3155 N92-27767

TELEROBOTICS
Automation and Robotics for Space-Based Systems, 1991
[NASA-CP-10098] p 3154 N92-27763
Summary of compliant and multi-arm control at NASA, Langley Research Center p 3155 N92-27764
EVA robotics for Space Station Freedom: Dextrous Manipulator Development (DEMAND) p 3155 N92-27765
IVA robotics for Space Station Freedom p 3155 N92-27766
Hand controller study of force and control mode p 3155 N92-27767
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
Automated assembly of large space structures p 3156 N92-27774
Development of a machine vision guidance system for automated assembly of space structures p 3156 N92-27775
End-effector microprocessor p 3145 N92-27776
Executive system software design and expert system implementation p 3152 N92-27778
Future work in automated assembly of large space structures p 3156 N92-27779
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms p 3113 N92-27780
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781

TELEVISION RECEPTION
UHF television reception: Ghost images from very large buildings
[BBC-RD-1992/1] p 3087 N92-28100

TELEVISION TRANSMISSION
UHF television reception: Ghost images from very large buildings
[BBC-RD-1992/1] p 3087 N92-28100
TEMPERATURE CONTROL
Thermal Control Surfaces Experiment (TCSE) materials analysis p 3070 N92-27274
Long Duration Exposure Facility (LDEF) low-temperature Heat Pipe Experiment Package (HEPP) flight results p 3106 N92-27317
Next generation optical instruments and space experiments based on the LDEF thermal control surfaces experiment (S0069) p 3171 N92-27326
TEMPERATURE DISTRIBUTION
Review of the physical oceanography of the Labrador Sea
[CGCR-90-12] p 3132 N92-27357
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle p 3100 N92-27482
Three-dimensional Ocean Thermal Structure (TOTS) software module software requirements specifications
[AD-A246146] p 3134 N92-27575
The ocean's thermohaline circulation: Its stability, variability, and role in climate
[CGCR-91-12] p 3136 N92-28199
TEMPERATURE EFFECTS
A generalized approach to the thermal analysis of the Long Duration Exposure Facility's flight experiments p 3179 N92-27221
Radiation and temperature effects on LDEF fiber optic cable samples --- long duration exposure facility p 3171 N92-27316
A study of the microstructural basis for the strength and toughness properties of overaged HSLA-100 steel
[AD-A246955] p 3073 N92-27332
Arterio-venous anastomoses and thermoregulation
[AD-A245385] p 3137 N92-27361
The effect of latent heat release on the ERICA IOP-5 cyclone
[AD-A245779] p 3130 N92-27912
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-108] p 3175 N92-28196
TEMPERATURE GRADIENTS
Local kinetic analysis of low frequency electrostatic modes in tokamaks
[PPL-110] p 3172 N92-27449
Electromagnetic semi-local kinetic analysis on the electron temperature gradient mode in tokamaks
[PPL-118] p 3173 N92-27581
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-103] p 3173 N92-27648
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-108] p 3175 N92-28196
Electromagnetic and kinetic effects on the ion temperature gradient mode
[PPL-113] p 3175 N92-28198
Effects of kinetic damping on the ion temperature gradient mode in tokamaks
[PPL-105] p 3175 N92-28204
TEMPERATURE MEASUREMENT
Acoustic sensing of ocean turbulence
[AD-A246752] p 3136 N92-28108
TEMPERATURE PROFILES
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168
TEMPERING
A study of the microstructural basis for the strength and toughness properties of overaged HSLA-100 steel
[AD-A246955] p 3073 N92-27332
TENSILE STRENGTH
Life prediction methodologies for composite materials
[AD-A248637] p 3070 N92-28202
TENSORS
Solutions of Einstein's equations having functionally separable metrics
[ISBN-0-315-60751-3] p 3179 N92-27688
The tensor equation AX + XA = G
[AD-A246665] p 3157 N92-27762
TERMINALS
Optical Terminal Definition for the Future Service Growth (FSG) module of the Advanced Tracking and Data Relay Satellite (ATDRSS)
[NASA-CR-189270] p 3055 N92-28219
TERRAIN
Area-of-Interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles p 3031 N92-27890
An efficient method for three-dimensional route planning with different strategies and constraints p 3033 N92-27901
Geometric rectification and geocoding of JPL's AIRSAR data over hilly terrain p 3088 N92-28035
TEST CHAMBERS
Effect of collector configuration on test section turbulence levels in an open-jet wind tunnel
[NASA-TM-4333] p 3051 N92-27670
The FML compressor as a drive system for the LFSWT: A narrative p 3052 N92-27978
Enhancement of boiling heat transfer in di-electric fluids
[AD-A245962] p 3105 N92-28058
TEST FACILITIES
Hypervelocity impact facility for simulating materials exposure to impact by space debris p 3192 N92-27250
Cryogenic test rig with an aerodynamic magnetically levitated carriage p 3052 N92-27792
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819
TEST STANDS
Analysis and testing of a space crane articulating joint testbed p 3156 N92-27773
TESTS
Mechanisms flown on LDEF p 3111 N92-27305
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Experimental results in nonlinear compensation of a one degree-of-freedom magnetic suspension p 3060 N92-27742
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers
[DE92-010449] p 3069 N92-27856
TETHERED SATELLITES
Dynamics and control of an orbiting space platform based tethered satellite system
[ISBN-0-315-58001-0] p 3056 N92-27646
TEXTS
Video-text processing by using Motorola 68020 CPU and its environment
[AD-A245775] p 3184 N92-27911
TEXTURES
Visual processing in texture segregation
[AD-A247173] p 3142 N92-28176
THEMATIC MAPPING
Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036
THEOREM PROVING
Deformations of complex structures on gamma/SL2(C) and cohomology of local systems p 3161 N92-27556
A formal model of asynchronous communication and its use in mechanically verifying a biphase mark protocol
[NASA-CR-4433] p 3153 N92-27586
Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661
THEORETICAL PHYSICS
Activities, accomplishments and research progress of the Center for Theoretical Geoplasma Physics, Center for Space Research, Massachusetts Inst. of Technology
[AD-A248572] p 3127 N92-27963
THERMAL ANALYSIS
A generalized approach to the thermal analysis of the Long Duration Exposure Facility's flight experiments p 3179 N92-27221
The effect of jet fuel exposure on advanced aerospace composites. Part 1: Thermal and chemical analysis
[AD-A246559] p 3068 N92-27531
Computer graphics for bearing dynamic analysis
[AD-A247567] p 3148 N92-27584
Glass sample preparation and performance investigations --- solar x-ray imager
[NASA-CR-190399] p 3169 N92-27871
THERMAL CONDUCTIVITY
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging
[AD-A246429] p 3088 N92-27204
Structural materials for high-heat flux applications
[DE92-010253] p 3073 N92-27346
THERMAL CONTROL COATINGS
Thermal Control Surfaces Experiment (TCSE) materials analysis p 3070 N92-27274
Thermal control paints on LDEF: Results of sub-experiment 802-18 p 3078 N92-27275
LDEF thermal control coatings post-flight analysis p 3078 N92-27276
Selected results for LDEF thermal control coatings p 3078 N92-27277
Flouorescence measurements of the thermal control coatings on LDEF experiments S0069 and A0114 p 3078 N92-27278
Atomic oxygen effects on thermal control and mirror coatings: Evaluation of experiment A0034 p 3078 N92-27279
Space environmental effects on LDEF composites: Leading graphite/epoxy panel, selected trailing edge specimens p 3070 N92-27290
Spacecraft thermal control coatings: Comparison between flight results obtained on LDEF and MIR p 3079 N92-27300
THERMAL CYCLING TESTS
Ruled and holographic experiment (AO 138-5) --- long duration exposure facility p 3107 N92-27312
Analysis of space environment effects on active fiber optic links orbited aboard the LDEF --- long duration exposure facility p 3171 N92-27315
THERMAL DIFFUSIVITY
Tokamak profiles based on models for the anomalous electron thermal diffusivity
[PPL-125] p 3171 N92-27446
Anomalous electron thermal diffusivity, anomalous particle pinch, and isotope effect due to the skin size electromagnetic drift mode
[PPL-116] p 3173 N92-27883
Microballooning mode in tokamaks
[PPL-107] p 3175 N92-28205
THERMAL ENVIRONMENTS
The use of electrical transmission line theory to predict the performance of spacecraft radiators
[AD-A247786] p 3091 N92-27861
THERMAL EXPANSION
Thermal expansion behavior of LDEF metal matrix composites p 3070 N92-27294
THERMAL FATIGUE
Structural analysis of thermal fatigue failures on rocket combustion chambers by the finite element method
[NAL-TR-1117] p 3067 N92-27430
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C
[AD-A246407] p 3069 N92-27752
THERMAL INSULATION
Detailed examination of LDEF's frame and the A0178 thermal blankets by the meteoroid and debris special investigations group p 3192 N92-27244
Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets p 3193 N92-27261
Thermal resistance values of some protective clothing ensembles
[AD-A245937] p 3144 N92-28166
THERMAL MAPPING
Adaptive compression of multisensor image data
[AD-A248389] p 3151 N92-28006
THERMAL PLASMAS
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640
THERMAL PROTECTION
Thermally sprayed coating systems for surface protection and clearance control applications in aero engines
[PNR-90802] p 3048 N92-27422
THERMAL RESISTANCE
Thermal resistance values of some protective clothing ensembles
[AD-A245937] p 3144 N92-28166
THERMAL STRESSES
Structural analysis of thermal fatigue failures on rocket combustion chambers by the finite element method
[NAL-TR-1117] p 3067 N92-27430
Residual thermal stresses in graphite/PEEK (APC-2) laminates
[AD-A247450] p 3077 N92-27592
THERMAL VACUUM TESTS
Long Duration Exposure Facility (LDEF) low-temperature Heat Pipe Experiment Package (HEPP) flight results p 3106 N92-27317
THERMOCHEMICAL PROPERTIES
Fundamental studies on droplet interactions in dense sprays
[AD-A246918] p 3101 N92-27546
THERMODYNAMIC PROPERTIES
Shape memory effect alloys
[DE92-619932] p 3074 N92-27875
THERMODYNAMICS
Adiabatic shear bands in simple and dipolar viscoplastic materials
[AD-A246055] p 3077 N92-27545
Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-91-17] p 3133 N92-27547
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques
[AD-A246066] p 3135 N92-27786

THERMOLUMINESCENCE
LDEF: Dosimetric measurement results (AO 138-7 experiment) p 3165 N92-27231
Absorbed dose measurements and predictions on LDEF p 3165 N92-27232
THERMOPLASTIC RESINS
LDEF polymeric materials: 10 months versus 5.8 years of exposure p 3079 N92-27282
Characterization of powder coated thermoplastic composite
[AD-A247230] p 3068 N92-27383
Synthesis and characterization of new poly(alkyl/arylphosphazenes)
[AD-A245380] p 3076 N92-27442
Residual thermal stresses in graphite/PEEK (APC-2) laminates
[AD-A247450] p 3077 N92-27592
THERMOREGULATION
Arterio-venous anastomoses and thermoregulation
[AD-A245385] p 3137 N92-27361
THICK FILMS
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409
THICK PLATES
Shielded metal arc welding consumables for advanced high strength steels
[AD-A247005] p 3075 N92-28136
THICKNESS
Atomic oxygen effects on LDEF experiment A0171
p 3079 N92-27280
THIN FILMS
Silazane to silica p 3079 N92-27285
Contamination on LDEF sources: Distribution and history p 3073 N92-27297
Interaction of atomic oxygen with thin film and bulk copper: An XPS, AES, XRD, and profilometer study
p 3166 N92-27302
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309
X ray scattering studies of polyimide thin films from poly(amic acid)s functionalized with a methacrylate
[DE92-010120] p 3075 N92-27364
The plasma physics of processing discharges
[AD-A247560] p 3172 N92-27563
Environmentally stable metal powders --- gas atomization process
[AD-D015222] p 3074 N92-27619
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837
Research in high dielectric properties of ferroelectric materials
[AD-A246899] p 3177 N92-27985
Large second-harmonic response of C60 thin films
[AD-A248957] p 3092 N92-28080
THREE DIMENSIONAL FLOW
A computational study of tip leakage flow and losses in a linear turbine cascade p 3095 N92-27453
A critical evaluation of a three-dimensional Navier-Stokes method as a tool to calculate transonic flows inside a low-aspect-ratio compressor
p 3096 N92-27459
Validation of a CANARI code by the computation of three dimensional turbulent flow in turbine valve
p 3050 N92-27462
Computation and visualization of specific flow phenomena in turbomachinery application
p 3050 N92-27463
Calculation by the finite element method of 3-D turbulent flow in a centrifugal pump p 3097 N92-27465
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row
p 3050 N92-27466
Viscous three-dimensional calculations of transonic fan performance p 3097 N92-27467
Three dimensional solution of internal flows using a cell vertex finite volume method p 3098 N92-27473
Validation of non-orthogonal three-dimensional laminar flow predictions p 3098 N92-27476
Three dimensional flow in sharp bends --- ducted flow
p 3099 N92-27481
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle
p 3100 N92-27482
Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485
Nonequilibrium 3D flows of air through inlets
p 3100 N92-27487
Three dimensional calculations of reactive flows within aircraft combustion chambers including some combustion models p 3101 N92-27490
THREE DIMENSIONAL MODELS
Three-dimensional shielding effects on charged particle fluences measured in the P0006 experiment in LDEF
p 3165 N92-27235
Development and application of a 3-D geometry/mass model for LDEF satellite ionizing radiation assessments
p 3165 N92-27236
Radiation model predictions and validation using LDEF data p 3165 N92-27237
A critical evaluation of a three-dimensional Navier-Stokes method as a tool to calculate transonic flows inside a low-aspect-ratio compressor
p 3096 N92-27459
Steady and unsteady 3D flow computation through a transonic turbine stage p 3050 N92-27469
Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485
Multidimensional upwind methods for unstructured grids p 3102 N92-27675
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190
THRESHOLDS (PERCEPTION)
Area-of-Interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863
THRUST BEARINGS
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
THRUST CONTROL
Dynamics and control of an orbiting space platform based tethered satellite system
[ISBN-0-315-56001-0] p 3056 N92-27646
THRUST VECTOR CONTROL
Flight-determined benefits of integrated flight-propulsion control systems
[NASA-TM-4393] p 3048 N92-27587
Fuzzy guidance system evaluation
p 3034 N92-27903
THUNDERSTORMS
Location and characterization of in-cloud lightning currents by multiple station VHF and electric field measurements
[AD-A247051] p 3131 N92-27988
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data
[AD-A248377] p 3085 N92-28003
TIME
Variable hold time in dynamic random access memories
[AD-A248602] p 3144 N92-28063
TIME CONSTANT
Conditions for the applicability of the regenerative method
[AD-A248598] p 3160 N92-28182
TIME LAG
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005
TIME MARCHING
Time-marching methods for secondary flow analysis in curved ducts p 3095 N92-27454
The application of a Navier-Stokes CFD method to civil engine intake flows p 3098 N92-27471
TIME MEASUREMENT
Experimental validation of clock synchronization algorithms
[NASA-TP-3209] p 3153 N92-27589
Investigation of an argon-filled thermoacoustic prime mover
[AD-A246751] p 3179 N92-28107
TIME MEASURING INSTRUMENTS
Model A: High-temperature tribometer
[AD-A249258] p 3107 N92-28217
TIME OF FLIGHT SPECTROMETERS
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047
TIME SERIES ANALYSIS
An investigation of multivariate adaptive regression splines for modeling and analysis of univariate and semi-multivariate time series systems
[AD-A246155] p 3159 N92-27578
TIN
Macrocycles containing tin
[AD-A246866] p 3163 N92-27351
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246836] p 3075 N92-28119
TITANIA
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012
TITANIUM NITRIDES
Tribological behavior of oil-lubricated, TiN-coated steel
[DE92-010500] p 3110 N92-27410
TITANIUM OXIDES
Nanophase materials assembled from clusters
[DE92-010508] p 3076 N92-27412
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012
TOKAMAK DEVICES
Tokamak profiles based on models for the anomalous electron thermal diffusivity
[PPL-125] p 3171 N92-27446
Destabilized ion acoustic transit mode and anomalous transport in tokamaks
[PPL-123] p 3172 N92-27447
Stability of long wavelength modes in tokamaks
[PPL-117] p 3172 N92-27448
Local kinetic analysis of low frequency electrostatic modes in tokamaks
[PPL-110] p 3172 N92-27449
Skin size electromagnetic drift mode and anomalous transport
[PPL-119] p 3172 N92-27580
Electromagnetic semi-local kinetic analysis on the electron temperature gradient mode in tokamaks
[PPL-118] p 3173 N92-27581
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-103] p 3173 N92-27648
Analytical formula for ignition access condition in a magnetic fusion reactor
[PPL-114] p 3173 N92-27882
Anomalous electron thermal diffusivity, anomalous particle pinch, and isotope effect due to the skin size electromagnetic drift mode
[PPL-116] p 3173 N92-27883
Operation path method for ignition criterion in a D-T tokamak reactor
[PPL-122] p 3174 N92-28193
Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194
Ballooning and drift-Alfven modes in tokamaks
[PPL-104] p 3174 N92-28195
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-108] p 3175 N92-28196
Local kinetic analysis of the ballooning mode in tokamaks
[PPL-111] p 3175 N92-28197
Effects of kinetic damping on the ion temperature gradient mode in tokamaks
[PPL-105] p 3175 N92-28204
Microballooning mode in tokamaks
[PPL-107] p 3175 N92-28205
TOLERANCES (PHYSIOLOGY)
Criticality of Be-7 concentration in LDEF
p 3165 N92-27238
TOMOGRAPHY
Acoustic tomography in the Greenland Sea
[AD-A246574] p 3133 N92-27533
TOPOGRAPHY
Subinertial circulation on the Scotian Shelf observations and models
[ISBN-0-315-56167-X] p 3134 N92-27621
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038
TOROIDAL PLASMAS
Stabilizing effect of dissipative trapped electrons on the energetic ion modes
[PPL-121] p 3172 N92-27579
Electromagnetic microinstability in toroidal plasmas
[PPL-115] p 3173 N92-27582
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-103] p 3173 N92-27648
Analytical formula for ignition access condition in a magnetic fusion reactor
[PPL-114] p 3173 N92-27882
Anomalous electron thermal diffusivity, anomalous particle pinch, and isotope effect due to the skin size electromagnetic drift mode
[PPL-116] p 3173 N92-27883
Operation path method for ignition criterion in a D-T tokamak reactor
[PPL-122] p 3174 N92-28193

Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194
Ballooning and drift-Alfven modes in tokamaks
[PPL-104] p 3174 N92-28195
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-108] p 3175 N92-28196
Local kinetic analysis of the ballooning mode in tokamaks
[PPL-111] p 3175 N92-28197
Electromagnetic and kinetic effects on the ion temperature gradient mode
[PPL-113] p 3175 N92-28198
Microballooning mode in tokamaks
[PPL-107] p 3175 N92-28205

TORQUE
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms
p 3113 N92-27780

TORQUERS
Performance of a superconducting large-angle magnetic suspension p 3065 N92-27815

TOTAL QUALITY MANAGEMENT
Highlights of total quality management in the Department of Defense: Lessons learned, quality measurements, and innovative practices
[AD-A246167] p 3114 N92-27602
An analysis of total quality management in Aeronautical Systems Division
[AD-A246661] p 3114 N92-27760

TOUGHNESS
High-toughness graphite/epoxy composite material experiment p 3070 N92-27289
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139

TOXICITY
The effects of hydrazines on neuronal excitability
[AD-A247103] p 3137 N92-27844
Clean air act requirements for trace metals information
[PB92-164995] p 3125 N92-28206

TRACKING (POSITION)
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles
p 3031 N92-27890
Advanced tactical aircraft early risk reduction phase 1 broad band IR window study
[AD-A246633] p 3046 N92-27982

TRACKING FILTERS
Frequency, amplitude, and phase tracking of nonsinusoidal signal in noise with extended Kalman filter
[AD-A246928] p 3090 N92-27506

TRAILING EDGE FLAPS
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations
p 3039 N92-27945

TRAILING EDGES
SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2
p 3193 N92-27259
Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces
p 3193 N92-27264
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
p 3041 N92-27958

TRAINING ANALYSIS
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836

TRAINING DEVICES
The advanced tactical fighter early, structured, and continuous user-interface process: A system program office/user team-building concept
[AD-A246641] p 3182 N92-27754
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836
The RHET system: A sequence of self-guided tutorials
[AD-A248960] p 3151 N92-28082

TRAINING EVALUATION
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518
A meta-analysis of pilot selection tests: Success and performance in pilot training
[AD-A246623] p 3140 N92-27537
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836

TRAINING SIMULATORS
NPSNET: Physically-based modeling enhancements to an object file format
[AD-A246594] p 3146 N92-27504

TRAJECTORIES
Design of fast earth-return trajectories from a lunar base
[AD-A246553] p 3053 N92-27530
On board planning of 4D-trajectories
p 3033 N92-27897
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898
Optimal guidance anticipating missile performance
p 3034 N92-27902

TRAJECTORY ANALYSIS
Small balloon ballistic tracing and behavior anomalies
[AD-A247435] p 3130 N92-27845

TRAJECTORY CONTROL
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898
Optimal guidance anticipating missile performance
p 3034 N92-27902

TRAJECTORY MEASUREMENT
Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328

TRAJECTORY OPTIMIZATION
Performance analysis of non-coplanar synergetic maneuvers
[AD-A246576] p 3054 N92-27534
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898

TRAJECTORY PLANNING
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant
p 3032 N92-27895
Comparison of the event-step algorithm to other path planning methods to avoid dynamic 3D obstacles
p 3033 N92-27896
An efficient method for three-dimensional route planning with different strategies and constraints
p 3033 N92-27901
Robust intelligent flight control for hypersonic vehicles
[NASA-CR-185680] p 3051 N92-28209

TRANSFER FUNCTIONS
Design of bearings for rotor systems based on stability
p 3063 N92-27799

TRANSFORMERS
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513

TRANSIENT RESPONSE
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007

TRANSISTORS
Development of a Ge/GaAs HMT technology based on plasma enhanced chemical vapor deposition
[AD-A246991] p 3176 N92-27381

TRANSITION FLOW
Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios
[AD-A246057] p 3104 N92-27828

TRANSITION METALS
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry
[AD-A248410] p 3072 N92-28009

TRANSITION PROBABILITIES
Exponential error bounds on codes for noisy channels with inaccurately known statistics and for generalized decision rules
[AD-A246064] p 3158 N92-27834

TRANSITION TEMPERATURE
Monolithic integration of semiconductor and superconductor components
[AD-A248952] p 3092 N92-28067

TRANSMISSION EFFICIENCY
Mid-range UV communications --- ultraviolet radiation
[AD-D015213] p 3083 N92-27615

TRANSMISSION LINES
High pressure fiber optic connector plug
[AD-D015246] p 3166 N92-27373
The use of electrical transmission line theory to predict the performance of spacecraft radiators
[AD-A247786] p 3091 N92-27861
An investigation of the information propagation and entropy transport aspects of Stirling machine numerical simulation
[NASA-CR-189143] p 3105 N92-27975

TRANSMISSIONS (MACHINE ELEMENTS)
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies
[NASA-TM-105416] p 3111 N92-27879

TRANSMISSIVITY
Modelling solar radiation in the Arctic: An improved method for the subdivision of global radiation
[AD-A246271] p 3194 N92-27818

TRANSMITTANCE
Characterization of semi-insulating gallium arsenide
[AD-A246511] p 3177 N92-27632

TRANSMITTER RECEIVERS
Acoustic tomography in the Greenland Sea
[AD-A246574] p 3133 N92-27533
Laser radar system demonstration: System requirements review, second demonstration receiver
[AD-A246159] p 3108 N92-27601
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784

TRANSMITTERS
Mid-range UV communications --- ultraviolet radiation
[AD-D015213] p 3083 N92-27615
Bi-directional optical transmission system for RF electrical energy
[AD-D015224] p 3169 N92-27999

TRANSONIC COMPRESSORS
A critical evaluation of a three-dimensional Navier-Stokes method as a tool to calculate transonic flows inside a low-aspect-ratio compressor
p 3096 N92-27459
On the computation of unsteady turbomachinery flows. Part 1: Euler equations in vibrating cascades
p 3096 N92-27460
Application of CFD in the design of gas turbine engine components p 3049 N92-27461

TRANSONIC FLOW
A critical evaluation of a three-dimensional Navier-Stokes method as a tool to calculate transonic flows inside a low-aspect-ratio compressor
p 3096 N92-27459
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row
p 3050 N92-27466
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications
p 3037 N92-27937
Unsteady aerodynamics for aeroelasticity at the Flight Dynamics Directorate p 3038 N92-27939
A time-linearization approach for unsteady transonic flows p 3038 N92-27941
A boundary integral formulation for unsteady transonic potential flows p 3038 N92-27942
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation
p 3039 N92-27944
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations
p 3039 N92-27945
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream
p 3039 N92-27946
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949
Transonic aeroelastic calculations in both the time and frequency domains p 3040 N92-27950
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow
p 3040 N92-27953
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957
Further investigation of the effect of model cooling on periodic transonic flow p 3042 N92-27961
NACA0012 airfoil data corrected for sidewall boundary-layer effects in the NAL two-dimensional transonic wind tunnel
[NAL-TM-640T] p 3042 N92-28151
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190

TRANSONIC FLUTTER
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications
p 3037 N92-27937
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947

TRANSONIC SPEED
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711

Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft
p 3041 N92-27958

TRANSONIC WIND TUNNELS
A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880
Transonic wind tunnel investigation of limit cycle oscillations on fighter type wings p 3041 N92-27959
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190

TRANSPORT AIRCRAFT
Drag reduction: An industrial challenge
p 3036 N92-27708
An analysis of fixed wing tactical airlifter characteristics using an intra-theater airlift computer model
[AD-A246908] p 3045 N92-27719

TRANSPORT PROPERTIES
An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399
Momentum transport by cumulus clouds and its parameterization
[ISBN-0-315-54644-1] p 3129 N92-27610
Transport in ultra-dense plasmas produced by a picosecond laser pulse
[AD-A247827] p 3174 N92-27921

TRANSPORT THEORY
Some basic research problems related to energy
[DE92-011220] p 3072 N92-28043

TRANSPORTATION
Heavy duty transport research needs assessment
[DE92-010622] p 3109 N92-27394

TRAPPED PARTICLES
Radioactivities induced in some LDEF samples
p 3164 N92-27225
The interstellar gas experiment: Analysis in progress
p 3145 N92-27266
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659

TRAVELING SALESMAN PROBLEM
Search route planning p 3033 N92-27900

TRAYS
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps
p 3193 N92-27256
Spectral infrared hemispherical reflectance measurements for LDEF tray clamps
p 3170 N92-27295
Contamination measurements on experiment M0003
p 3073 N92-27298

TRENDS
Technology trends, threats, and opportunities (T(sup 3)O). Part 4: Proceedings of Workshop on Critical Enabling Technologies
[CTN-92-60495] p 3181 N92-27703

TRIANGULATION
A frontal approach for node generation in Delaunay triangulations p 3103 N92-27680

TRIBOLOGY
Tribological behavior of oil-lubricated, TiN-coated steel
[DE92-010500] p 3110 N92-27410
Model A: High-temperature tribometer
[AD-A249258] p 3107 N92-28217

TRIMETHYL COMPOUNDS
Bislactone curing agents for epoxy resins and polymers obtained therefrom
[AD-D015221] p 3077 N92-27618

TRINITROTOLUENE
Explosives simulants
[DE92-011074] p 3080 N92-27418

TRITIUM
Tritium measurement technique using in-bed calorimetry
[DE92-010061] p 3079 N92-27363

TROPICAL REGIONS
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037

TRUSSES
Ground vibration tests of a high fidelity truss for verification of on orbit damage location techniques
[NASA-TM-107626] p 3115 N92-27375
Panel installation development in Automated Structures Assembly Lab p 3156 N92-27777
Development of a truss joint for robotic assembly of space structures
[NASA-TP-3214] p 3117 N92-27974

TUNABLE LASERS
Spectral properties of a novel laser crystal Y3(In, Ga)2Ga3O12:Cr3(+)
[AD-A246254] p 3175 N92-27201
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085

TUNGSTEN ALLOYS
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819

TURBINE BLADES
Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades
p 3095 N92-27456
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade
p 3095 N92-27457
An integrated CFD system for 3D turbomachinery applications p 3050 N92-27464
Navier-Stokes analysis of turbine blade heat transfer and performance p 3097 N92-27468
Numerical representation of heat transfer into turbine blade cooling ducts p 3098 N92-27474
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519

TURBINE ENGINES
Ceramic composites: Enabling aerospace materials
[NASA-TM-105599] p 3076 N92-27378

TURBINE PUMPS
An experimental study of a small high speed LH2 rocket pump: A suppression method of asynchronous shaft vibrations
[NAL-TR-1118] p 3110 N92-27431
Magnetic bearings: A key technology for advanced rocket engines? p 3057 N92-27725
Advanced materials for turbomachinery. Technical memo number 2: Advanced materials compatibility with storable propellants (monomethyl hydrazine and nitrogen tetroxide)
[AD-A246725] p 3080 N92-28070

TURBINE WHEELS
Radial inflow turbine study
[AD-A246938] p 3049 N92-28073

TURBINES
Validation of a CANARI code by the computation of three dimensional turbulent flow in turbine valve
p 3050 N92-27462
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation
p 3039 N92-27944

TURBOCOMPRESSORS
Application of S1BYL2 to the AGARD WG18 compressor test cases p 3094 N92-27452
Self-adaptive aeropropulsion components-enhancing axial compressor performance
[AD-A246123] p 3049 N92-27817

TURBOMACHINE BLADES
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation
p 3039 N92-27944

TURBOMACHINERY
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450
Turbine internal fluid flow analysis and Stokes' hypothesis p 3095 N92-27455
A mathematical constraint placed upon inter-blade row boundary conditions used in the simulation of multistage turbomachinery flows p 3095 N92-27458
On the computation of unsteady turbomachinery flows. Part 1: Euler equations in vibrating cascades
p 3096 N92-27460
Computation and visualization of specific flow phenomena in turbomachinery application
p 3050 N92-27463
Presentation of a computational code for 3-D compressible flow in complex channels and cavities
p 3098 N92-27475
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
Magnetic bearings: A key technology for advanced rocket engines? p 3057 N92-27725
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740

TURBULENCE
An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399
Effect of collector configuration on test section turbulence levels in an open-jet wind tunnel
[NASA-TM-4333] p 3051 N92-27670
Turbulent cooling flows in galaxies and clusters
[ISBN-0-315-61634-2] p 3191 N92-27699
Study of turbulence structure through numerical simulations: The perspective of drag and reduction
p 3037 N92-27713
Particle image velocimetry
[AD-A246638] p 3052 N92-27753
Turbulence structure and polymer drag reduction in adverse pressure gradient boundary layers
[AD-A246651] p 3104 N92-27757

TURBULENCE EFFECTS
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714

TURBULENCE MODELS
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade
p 3095 N92-27457
An integrated CFD system for 3D turbomachinery applications p 3050 N92-27464
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row
p 3050 N92-27466
Viscous three-dimensional calculations of transonic fan performance p 3097 N92-27467
Development of an algebraic turbulence model for analysis of propulsion flows
[NASA-TM-105701] p 3157 N92-27517
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations
p 3103 N92-27677
A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880
A study of compressible turbulence
[AD-A247001] p 3105 N92-27986
Comparative study of turbulence models in predicting hypersonic inlet flows
[NASA-TM-105720] p 3042 N92-28102

TURBULENT BOUNDARY LAYER
Turbulent heat flux measurements in a transitional boundary layer
[NASA-TM-105623] p 3035 N92-27377
An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
Basic concepts on boundary layers
p 3036 N92-27707
Laminar-turbulent transition: Fundamentals
p 3036 N92-27710
Study of turbulence structure through numerical simulations: The perspective of drag and reduction
p 3037 N92-27713
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
Turbulence structure and polymer drag reduction in adverse pressure gradient boundary layers
[AD-A246651] p 3104 N92-27757
Experimental investigation of turbulence behavior in shock wave/turbulent boundary layer interactions
[AD-A247792] p 3104 N92-27886
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949

TURBULENT FLOW
Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352
Turbulent heat flux measurements in a transitional boundary layer
[NASA-TM-105623] p 3035 N92-27377
Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade
p 3095 N92-27457
Validation of a CANARI code by the computation of three dimensional turbulent flow in turbine valve
p 3050 N92-27462
Calculation by the finite element method of 3-D turbulent flow in a centrifugal pump p 3097 N92-27465
Numerical representation of heat transfer into turbine blade cooling ducts p 3098 N92-27474
Computational modelling of turbulent flow in S-bends
p 3099 N92-27480
Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber
p 3050 N92-27484
The coherent flamelet model for propulsion applications p 3073 N92-27486
Development of an algebraic turbulence model for analysis of propulsion flows
[NASA-TM-105701] p 3157 N92-27517
Calculation of turbulent reactive flows in general orthogonal coordinates
[NRC-32128] p 3104 N92-27693
Laminar-turbulent transition: Fundamentals
p 3036 N92-27710
Study of turbulence structure through numerical simulations: The perspective of drag and reduction
p 3037 N92-27713

Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
Self-adaptive aeropropulsion components-enhancing axial compressor performance
[AD-A246123] p 3049 N92-27817
Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios
[AD-A246057] p 3104 N92-27828
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853
A study of compressible turbulence
[AD-A247001] p 3105 N92-27986
Acoustic sensing of ocean turbulence
[AD-A246752] p 3136 N92-28106

TURBULENT HEAT TRANSFER
Turbulent heat flux measurements in a transitional boundary layer
[NASA-TM-105623] p 3035 N92-27377

TVD SCHEMES
Multidimensional upwind methods for unstructured grids p 3102 N92-27675
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes p 3103 N92-27678
Pressure-based high-order TVD methodology for dynamic stall control
[AD-A247056] p 3105 N92-27918

TWO DIMENSIONAL BOUNDARY LAYER
A fast, uncoupled, compressible, two-dimensional, unsteady boundary layer algorithm with separation for engine inlets
[NASA-TM-105686] p 3102 N92-27653

TWO DIMENSIONAL FLOW
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489
Development of an algebraic turbulence model for analysis of propulsion flows
[NASA-TM-105701] p 3157 N92-27517
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
NACA0012 airfoil data corrected for sidewall boundary-layer effects in the NAL two-dimensional transonic wind tunnel
[NAL-TM-640T] p 3042 N92-28151
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190

TWO DIMENSIONAL MODELS
Interpretation of time domain electromagnetic soundings near geological contacts
[DE92-010467] p 3126 N92-27347
Multidimensional upwind methods for unstructured grids p 3102 N92-27675
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations p 3103 N92-27677

TYROSINE
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094

U

U.S.S.R.
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740

U.S.S.R. SPACE PROGRAM
JPRS report: Science and technology. Central Eurasia: Space
[JPRS-USP-92-001] p 3053 N92-27931
Gamma astronomy satellite p 3053 N92-27932
Orbital solar electric power stations p 3053 N92-27933

ULTRAHIGH FREQUENCIES
UHF television reception: Ghost images from very large buildings
[BBC-RD-1992/1] p 3087 N92-28100

ULTRAVIOLET RADIATION
Thermal control paints on LDEF: Results of sub-experiment 802-18 p 3078 N92-27275
Flouorescence measurements of the thermal control coatings on LDEF experiments S0069 and A0114 p 3078 N92-27278
An ESR study of the UV degradation of FEP p 3079 N92-27287
Study of the charge and energy distributions of low-energy particles of cosmic radiation in the near-earth orbit by the method of controllable nuclear emulsion
[DE92-620924] p 3195 N92-27494
Mid-range UV communications --- ultraviolet radiation
[AD-D015213] p 3083 N92-27615

ULTRAVIOLET SPECTROSCOPY
Chemical analysis of aromatics in diesel fuels
[PB92-167311] p 3072 N92-28207

UNCONSCIOUSNESS
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371

UNDERWATER ACOUSTICS
Testing the accuracy of a three-dimensional acoustic coupled mode model
[AD-A247149] p 3162 N92-27369
Software tools for acoustic database management
[AD-A247636] p 3181 N92-27553
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655

UNDERWATER VEHICLES
An approach to integration of real-time software for an autonomous underwater vehicle
[AD-A245377] p 3154 N92-27441

UNITED STATES
Improving the impact of Federal scientific and technical information: A call for action p 3186 N92-28149

UNIVERSE
Birth of universes with non-minimal coupling
[ISBN-0-315-55826-1] p 3190 N92-27623
Development of voids in the thin-wall approximation
[ISBN-0-315-60772-6] p 3191 N92-27689

UNIVERSITIES
National oceanographic fleet platform characteristics
[AD-A246452] p 3135 N92-27667

UNIVERSITY PROGRAM
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 9: Wright Laboratory
[AD-A248772] p 3218 N92-28096
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 6: Armstrong Laboratory, Wilford Hall Medical Center
[AD-A248769] p 3219 N92-28109
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 7: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248770] p 3219 N92-28110
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 8: Rome Laboratory, Arnold Engineering Development Center, F. J. Seiler Research Laboratory
[AD-A248771] p 3219 N92-28111
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5A: Wright Laboratory
[AD-A248767] p 3219 N92-28127
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5B: Wright Laboratory
[AD-A248768] p 3219 N92-28128
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research
[NASA-TM-107925] p 3187 N92-28220

UNIX (OPERATING SYSTEM)
SLAC B Factory computing
[DE92-010745] p 3154 N92-27368

UNSTEADY AERODYNAMICS
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications p 3037 N92-27937
Unstructured-grid methods development for unsteady aerodynamic and aeroelastic analyses p 3038 N92-27938
Unsteady aerodynamics for aeroelasticity at the Flight Dynamics Directorate p 3038 N92-27939
Recent applications of linear and nonlinear unsteady aerodynamics for aeroelastic analysis p 3038 N92-27940
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations p 3039 N92-27945
Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream p 3039 N92-27946
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947
Computations of unsteady flows around airfoil sections by explicit and implicit methods solving the Euler and Navier-Stokes equations p 3039 N92-27948
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949
Aeroelastic calculations for fighter aircraft using the transonic small disturbance equation p 3040 N92-27951
Computation of flutter boundaries in the time and frequency domain p 3040 N92-27952
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow p 3040 N92-27953
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956
Transonic wind tunnel investigation of limit cycle oscillations on fighter type wings p 3041 N92-27959
The benchmark aeroelastic models program: Description and highlights of initial results p 3041 N92-27960
A review of scale effects on surfaces in unsteady motion p 3042 N92-27962

UNSTEADY FLOW
On the computation of unsteady turbomachinery flows. Part 1: Euler equations in vibrating cascades p 3096 N92-27460
Calculation by the finite element method of 3-D turbulent flow in a centrifugal pump p 3097 N92-27465
Steady and unsteady 3D flow computation through a transonic turbine stage p 3050 N92-27469
Unsteady Euler calculations in 3D internal aerodynamics p 3098 N92-27470
Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674
Unstructured grid methods for compressible flows p 3103 N92-27676
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
A time-linearization approach for unsteady transonic flows p 3038 N92-27941
A boundary integral formulation for unsteady transonic potential flows p 3038 N92-27942
Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation p 3039 N92-27944
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations p 3039 N92-27945
Computations of unsteady flows around airfoil sections by explicit and implicit methods solving the Euler and Navier-Stokes equations p 3039 N92-27948
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow p 3040 N92-27953
The benchmark aeroelastic models program: Description and highlights of initial results p 3041 N92-27960

UNSTEADY STATE
Experimental investigation of the unsteady pressure field around an oscillating blade
[MITT-90-01] p 3094 N92-27407

UPPER ATMOSPHERE
Oxygen isotopes implanted in the LDEF spacecraft p 3165 N92-27284

UPPER SURFACE BLOWING
Evaluation of high lift devices of the quiet STOL experimental aircraft ASKA
[NAL-TR-1102] p 3046 N92-28153
Note on flight measured control effectiveness of the quiet STOL experimental aircraft ASKA
[NAL-TR-1103] p 3051 N92-28154
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191

URBAN TRANSPORTATION
Knolle Magnetrans: A magnetically levitated train system p 3065 N92-27812

USER MANUALS (COMPUTER PROGRAMS)
Users manual and modeling improvements for axial turbine design and performance computer code TD2-2
[NASA-CR-189118] p 3035 N92-27376
BLADE: A propeller blade geometry generator program user's manual
[DREA-91-302] p 3149 N92-27697
Engine structures modeling software system: Computer code. User's manual
[NASA-CR-189154] p 3116 N92-27872
Documentation requirements for software maintenance
[AD-A246716] p 3151 N92-28069

USER REQUIREMENTS
NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397
Using Ada bindings to the X window system
[AD-A245366] p 3146 N92-27436
Concept-flow diagrams: Method for design of computer-aided instruction
[AD-A246896] p 3150 N92-27984

V

VALLEYS
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada p 3121 N92-28027

VAPOR DEPOSITION
Development of a Ge/GaAs HMT technology based on plasma enhanced chemical vapor deposition [AD-A246991] p 3176 N92-27381
Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology [AD-A246989] p 3089 N92-27401
Diamond as an optical material [AD-A247628] p 3167 N92-27599

VAPOR PHASES
A study of the gas-phase chemistry of solid propellant ingredients using CO2 laser heating [AD-A246510] p 3080 N92-27631
Gas-phase reactions of silver cluster ions produced by fast atom bombardment [AD-A248401] p 3164 N92-28008
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2 [AD-A245907] p 3081 N92-28161

VAPORIZERS
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber p 3050 N92-27484

VAPORIZING
Fundamental studies on droplet interactions in dense sprays [AD-A246918] p 3101 N92-27546
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry [AD-A248410] p 3072 N92-28009

VAPORS
Solid-vapor adsorption refrigeration system development [PB92-164383] p 3081 N92-27715

VARIABILITY
Behavioral variability, learning processes, and creativity [AD-A248894] p 3141 N92-27971
The ocean's thermohaline circulation: Its stability, variability, and role in climate [CGCR-91-12] p 3136 N92-28199

VARIATIONS
Variable hold time in dynamic random access memories [AD-A248602] p 3144 N92-28063

VASOCONSTRICTION
Arterio-venous anastomoses and thermoregulation [AD-A245385] p 3137 N92-27361

VASODILATION
Arterio-venous anastomoses and thermoregulation [AD-A245385] p 3137 N92-27361

VECTOR PROCESSING (COMPUTERS)
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems [NASA-CR-186516] p 3116 N92-27874

VECTOR QUANTIZATION
Data compression using artificial neural networks [AD-A246906] p 3149 N92-27718

VECTORS (MATHEMATICS)
The multicomputer toolbox approach to concurrent BLAS and LACs [DE92-010401] p 3148 N92-27391

VEGETATION
Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019
Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036

VEGETATION GROWTH
Final results of the Space Exposed Experiment Developed for Students (SEEDS) P-0004-2 p 3136 N92-27322
Continued results of the seeds in space experiment p 3136 N92-27323
Analysis of soil and species composition [NASA-CR-190065] p 3118 N92-27543
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991 [NASA-TM-107546] p 3136 N92-27877
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019

VEHICULAR TRACKS
The concept of the mechanically active guideway as a novel approach to maglev p 3064 N92-27807
Battery cars on superconducting magnetically levitated carriers: One commuting solution p 3065 N92-27811
Knolle Magnetrans: A magnetically levitated train system p 3065 N92-27812

VELOCITY DISTRIBUTION
Unsteady Euler calculations in 3D internal aerodynamics p 3098 N92-27470
Three dimensional flow in sharp bends --- ducted flow p 3099 N92-27481
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques [AD-A246066] p 3135 N92-27786

VELOCITY MEASUREMENT
Particle image velocimetry [AD-A246638] p 3052 N92-27753

VELOCITY MODULATION
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085

VENTILATION
Thermal resistance values of some protective clothing ensembles [AD-A245937] p 3144 N92-28166

VERBAL COMMUNICATION
Dual-task performance as a function of presentation mode and individual differences in verbal and spatial ability [AD-A246611] p 3139 N92-27535

VERTICAL AIR CURRENTS
The modelling of turbulence and downbursts for flight simulators [ISBN-0-315-59945-6] p 3051 N92-27645

VERTICAL DISTRIBUTION
CCN spectra measurements as an active tracer of stratocumulus mechanisms --- cloud condensation nuclei [AD-A246499] p 3129 N92-27668

VERTICAL LANDING
Experimental performance of three design factors for ventral nozzles for SSTOVL aircraft [NASA-TM-105697] p 3049 N92-27669

VERY HIGH FREQUENCIES
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization [AD-A246040] p 3084 N92-27784
Location and characterization of in-cloud lightning currents by multiple station VHF and electric field measurements [AD-A247051] p 3131 N92-27988

VERY LARGE ARRAY (VLA)
VLA, PHOENIX and BATSE observations of an X1 flare [AD-A248461] p 3194 N92-27935

VERY LARGE SCALE INTEGRATION
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging [AD-A246429] p 3088 N92-27204
Research into the design and implementation of knowledge-base system [AD-A247039] p 3151 N92-28075

VERY LONG BASE INTERFEROMETRY
Examination of selected jets of extragalactic radio sources [ETN-92-90827] p 3195 N92-27405

VIBRATION
Numerical investigations of breather solitons in nonlinear vibratory lattices [AD-A246524] p 3178 N92-27527
Characterization of semi-insulating gallium arsenide [AD-A246511] p 3177 N92-27632
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956
Vibrational spectroscopic studies of surface chemical interactions in chemisorption and catalysis [DE92-011189] p 3072 N92-28046
Nonlinear aspects of shock response in isolated accelerometers [DE92-010827] p 3107 N92-28054

VIBRATION DAMPING
An experimental study of a small high speed LH2 rocket pump: A suppression method of asynchronous shaft vibrations [NAL-TR-1118] p 3110 N92-27431
Add-on damping treatment for life extension of the F-15 upper-outer wing skin [AD-A246149] p 3050 N92-27577
Optimal control of large space structures using distributed gyricity: A continuum approach [ISBN-0-315-56953-0] p 3056 N92-27612
Application of narrow band control to reduce vibrations in magnetic bearing systems p 3057 N92-27729
Dynamics and control of high precision magnetically levitated vibration isolation systems p 3058 N92-27730
Stability and performance of notch filter control for unbalance response p 3058 N92-27731
Characterization of superconducting magnetic bearings (dynamic stiffness and damping coefficient in axial direction) p 3059 N92-27737
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740
Control concepts for active magnetic bearings p 3060 N92-27743
A microgravity vibration isolation rig p 3060 N92-27745
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields p 3060 N92-27746
The mechanical properties of metal-void composites --- pressurized microvoids [AD-A246087] p 3069 N92-27749
RMS active damping augmentation p 3155 N92-27771
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782
An evaluation of some strategies for vibration control of flexible rotors p 3063 N92-27800
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies [NASA-TM-105416] p 3111 N92-27879

VIBRATION EFFECTS
An experimental study of a small high speed LH2 rocket pump: A suppression method of asynchronous shaft vibrations [NAL-TR-1118] p 3110 N92-27431
On the computation of unsteady turbomachinery flows. Part 1: Euler equations in vibrating cascades p 3096 N92-27460

VIBRATION ISOLATORS
Dynamics and control of high precision magnetically levitated vibration isolation systems p 3058 N92-27730
A six degree-of-freedom magnetic bearing for microgravity vibration isolation p 3058 N92-27732
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740
Extended H2 synthesis for multiple degree-of-freedom controllers p 3059 N92-27741
Control concepts for active magnetic bearings p 3060 N92-27743
A microgravity vibration isolation rig p 3060 N92-27745
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747

VIBRATION MODE
Add-on damping treatment for life extension of the F-15 upper-outer wing skin [AD-A246149] p 3050 N92-27577

VIBRATION TESTS
Ground vibration tests of a high fidelity truss for verification of on orbit damage location techniques [NASA-TM-107626] p 3115 N92-27375
Advanced baffle materials technology development [AD-A247935] p 3169 N92-27826

VIBRATORY LOADS
Add-on damping treatment for life extension of the F-15 upper-outer wing skin [AD-A246149] p 3050 N92-27577

VIDEO SIGNALS
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers [AD-A247574] p 3108 N92-27566
Subcarrier-multiplexed coherent optical video transmission using direct frequency modulation of semiconductor lasers [AD-A247618] p 3167 N92-27597
Video-text processing by using Motorola 68020 CPU and its environment [AD-A245775] p 3184 N92-27911

VIEW EFFECTS
PET studies of components of high-level vision [AD-A246449] p 3140 N92-27822

VIEWING
PET studies of components of high-level vision [AD-A246449] p 3140 N92-27822

VIRTUAL REALITY
Automated generation of three-dimensional virtual worlds for task explanation [AD-A247859] p 3154 N92-27389

VISCOELASTICITY
The viscoelastic characterization of polymer materials exposed to the low-Earth orbit environment p 3079 N92-27283

VISCOPLASTICITY
Adiabatic shear bands in simple and dipolar viscoplastic materials [AD-A246055] p 3077 N92-27545

VISCOSITY
Three dimensional solution of internal flows using a cell vertex finite volume method p 3098 N92-27473

Finite element methods for flow problems
p 3102 N92-27672
Laminar-turbulent transition: Fundamentals
p 3036 N92-27710
The structure of MFD shock waves in a model of two fluids
[DE92-622860] p 3106 N92-28216

VISCOUS DAMPING
Identification of dynamic structures with special attention to damping matrix representation
[AD-A248020] p 3116 N92-27865

VISCOUS DRAG
Aircraft drag reduction p 3036 N92-27709
Study of turbulence structure through numerical simulations: The perspective of drag and reduction
p 3037 N92-27713

VISCOUS FLOW
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row
p 3050 N92-27466
Viscous three-dimensional calculations of transonic fan performance p 3097 N92-27467
The application of a Navier-Stokes CFD method to civil engine intake flows p 3098 N92-27471
Finite element solution of viscous compressible flows in gas turbine ducts and diffusers p 3099 N92-27477
A fast, uncoupled, compressible, two-dimensional, unsteady boundary layer algorithm with separation for engine inlets
[NASA-TM-105686] p 3102 N92-27653
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications
p 3037 N92-27937
Recent applications of linear and nonlinear unsteady aerodynamics for aeroelastic analysis
p 3038 N92-27940
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations
p 3039 N92-27945
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949
Steady and transient analysis of flows exhibiting strong viscous/inviscid interaction (Composite RNS procedures)
[AD-A247171] p 3105 N92-28175

VISION
What and where in visual attention: Evidence from the neglect syndrome
[AD-A246932] p 3139 N92-27509
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142

VISUAL ACCOMMODATION
The influence of subject expectation on visual accommodation in the dark
[AD-A245923] p 3142 N92-28164

VISUAL ACUITY
Spatio-temporal masking: Hyperacuity and local adaptation
[AD-A246953] p 3138 N92-27331
Area-of-Interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27863
The influence of subject expectation on visual accommodation in the dark
[AD-A245923] p 3142 N92-28164

VISUAL DISCRIMINATION
Spatio-temporal masking: Hyperacuity and local adaptation
[AD-A246953] p 3138 N92-27331
Visual processing in texture segregation
[AD-A247173] p 3142 N92-28176

VISUAL PERCEPTION
Visual attention and perception in three-dimensional space
[AD-A247823] p 3141 N92-27910
Reference frames in vision
[AD-A248743] p 3138 N92-27968
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142
Visual perception of features and objects
[AD-A248578] p 3142 N92-28170

VISUAL STIMULI
Spatio-temporal masking: Hyperacuity and local adaptation
[AD-A246953] p 3138 N92-27331
What and where in visual attention: Evidence from the neglect syndrome
[AD-A246932] p 3139 N92-27509

VISUAL TASKS
Human image understanding
[AD-A247048] p 3140 N92-27825

VOIDS
Development of voids in the thin-wall approximation
[ISBN-0-315-60772-6] p 3191 N92-27689
The mechanical properties of metal-void composites — pressurized microvoids
[AD-A246087] p 3069 N92-27749

VOLT-AMPERE CHARACTERISTICS
High speed interdigital MSM photodiodes
[ISBN-0-315-57980-3] p 3090 N92-27639

VOLTAGE AMPLIFIERS
Force analysis of magnetic bearings with power-saving controls p 3062 N92-27795

VORTEX BREAKDOWN
Trajectories and stability of trailing vortices very near the ground
[NRC-32151] p 3035 N92-27344

VORTEX GENERATORS
Evaluation of high lift devices of the quiet STOL experimental aircraft ASKA
[NAL-TR-1102] p 3046 N92-28153
A gust generation method for full configuration aircraft tests in a low speed wind tunnel. Part 1: Design and preliminary experiments
[NAL-TR-1115-PT-1] p 3043 N92-28192

VORTICES
A computational study of tip leakage flow and losses in a linear turbine cascade p 3095 N92-27453
The eddy structures in bounded shear flows
p 3037 N92-27712
Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios
[AD-A246057] p 3104 N92-27828
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853
Pressure-based high-order TVD methodology for dynamic stall control
[AD-A247056] p 3105 N92-27918
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications
p 3037 N92-27937

VULNERABILITY
Survivability of meteor burst communication under adverse operating conditions
[AD-A248632] p 3085 N92-28065

W

WAFERS
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409

WALL FLOW
Finite element solution of viscous compressible flows in gas turbine ducts and diffusers p 3099 N92-27477
Computational modelling of turbulent flow in S-bends
p 3099 N92-27480
Development of an algebraic turbulence model for analysis of propulsion flows
[NASA-TM-105701] p 3157 N92-27517
Study of turbulence structure through numerical simulations: The perspective of drag and reduction
p 3037 N92-27713

WALL TEMPERATURE
Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades
p 3095 N92-27456
Further investigation of the effect of model cooling on periodic transonic flow p 3042 N92-27961

WALLS
Particle image velocimetry
[AD-A246638] p 3052 N92-27753
Comparative study of turbulence models in predicting hypersonic inlet flows
[NASA-TM-105720] p 3042 N92-28102

WAR GAMES
Airpower planning and battle management training at airbase level p 3031 N92-27889

WARFARE
STAR 21: Strategic technologies for the Army of the twenty-first century
[REPT-92-8945] p 3160 N92-27423
Foreign object damage to tires operating in a wartime environment
[AD-A247195] p 3043 N92-27682
Interdiction mission planning and co-ordination during the Gulf conflict 17 January - 27 February 1991
p 3031 N92-27888

WARM FRONTS
Modeling and observational studies of mesoscale air-mass boundaries and warm-season convective precipitation
[AD-A247030] p 3128 N92-27336

WATER CIRCULATION
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515

WATER EROSION
Hindcast wave information for the great lakes: Lake Ontario
[AD-A246446] p 3135 N92-27820

WATER IMMERSION
High-solids and 100-percent solids coatings: A state-of-the-art investigation
[AD-A247557] p 3076 N92-27539

WATER RUNOFF
Interannual variability of sea-level pressure, sea-ice, and runoff over the Arctic
[CGCR-91-6] p 3132 N92-27356

WATER WAVES
Hindcast wave information for the great lakes: Lake Ontario
[AD-A246446] p 3135 N92-27820
A self-zeroing capacitance probe for water wave measurements
[NASA-RP-1278] p 3135 N92-27930

WATERSHEDS
Monsoon 1990: Preliminary SAR results
p 3120 N92-28022

WAVE ATTENUATION
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908
Determination of shear wave velocity structure in the Rio Grande rift through receiver function and surface wave analysis, appendix B
[AD-A246937] p 3128 N92-28072

WAVE DISPERSION
Local kinetic analysis of low frequency electrostatic modes in tokamaks
[PPL-110] p 3172 N92-27449

WAVE EQUATIONS
Wave-wave interactions in a steady-state stratospheric model, part 1
[CRG-89-5-PT-1] p 3126 N92-27355
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659
Wave-wave interactions in a steady-state stratospheric model, part 2
[CRG-89-6-PT-2] p 3128 N92-28201

WAVE FRONTS
Conference on Combined Effects: Radiation, Microg ravity, Trauma, and other Factors
[AD-A247799] p 3065 N92-27862

WAVE INTERACTION
Wave-wave interactions in a steady-state stratospheric model, part 2
[CRG-89-6-PT-2] p 3128 N92-28201

WAVE PROPAGATION
Experimental investigation of energy dissipation in finite-amplitude standing waves
[AD-A246428] p 3109 N92-27203
Wave propagation at regional distances
[AD-A246890] p 3126 N92-27380
An analysis of the Stress Wave In Solids (SWIS) finite element code
[AD-A245921] p 3115 N92-27573

WAVE SCATTERING
Wave propagation at regional distances
[AD-A246890] p 3126 N92-27380

WAVE-PARTICLE INTERACTIONS
Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004

WAVEFORMS
Compression and decompression of digital seismic waveform data for storage and communication
[DE92-621016] p 3183 N92-27496
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data
[AD-A248377] p 3085 N92-28003
Determination of shear wave velocity structure in the Rio Grande rift through receiver function and surface wave analysis, appendix B
[AD-A246937] p 3128 N92-28072

WAVEGUIDE FILTERS
Theory of multilayer dielectric planar waveguides and its applications
[ISBN-0-315-49255-4] p 3168 N92-27625
A circuit model for two-path cutoff waveguide dielectric resonator filters
[AD-A247785] p 3092 N92-27884

WAVEGUIDES
A circuit model for two-path cutoff waveguide dielectric resonator filters
[AD-A247785] p 3092 N92-27884
Nonlinear effects in optical fibers
p 3086 N92-28088

WAVELENGTH DIVISION MULTIPLEXING
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656
WAVELENGTHS
Holmium laser pumped with a neodymium laser
[AD-D015220] p 3108 N92-27617
WEAK INTERACTIONS (FIELD THEORY)
Estimation of oblique electroweak corrections
[DE92-010742] p 3179 N92-28160
WEAPON SYSTEMS
Dual modular rocket launcher
[AD-D015228] p 3046 N92-28002
WEAPONS DEVELOPMENT
Some advances in US space defense systems
[AD-A246038] p 3160 N92-27658
WEAR TESTS
The relationship between fuel lubricity and diesel injection system wear
[AD-A247927] p 3110 N92-27851
Model A: High-temperature tribometer
[AD-A249258] p 3107 N92-28217
WEATHER
Dust and sand forecasting in Iraq and adjoining countries
[AD-A247588] p 3129 N92-27551
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666
WEATHER FORECASTING
Modeling and observational studies of mesoscale air-mass boundaries and warm-season convective precipitation
[AD-A247030] p 3128 N92-27336
Dust and sand forecasting in Iraq and adjoining countries
[AD-A247588] p 3129 N92-27551
The effect of latent heat release on the ERICA IOP-5 cyclone
[AD-A245779] p 3130 N92-27912
Navy Atmospheric Boundary Layer (NABL) model system: Software/interface requirements specification
[AD-A247501] p 3127 N92-27922
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168
WEIBULL DENSITY FUNCTIONS
Bivariate extreme value distributions
[NASA-CR-4444] p 3159 N92-27588
WEIGHT REDUCTION
Feasibility of magnetic bearings for advanced gas turbine engines p 3059 N92-27738
WEIGHTLESSNESS
A microgravity vibration isolation rig
p 3060 N92-27745
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747
WEIGHTLESSNESS SIMULATION
Metabolic energy requirements for space flight
[NASA-TM-107933] p 3138 N92-28212
WELDED JOINTS
Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318
[DE92-009408] p 3117 N92-28041
Shielded metal arc welding consumables for advanced high strength steels
[AD-A247005] p 3075 N92-28136
WETTABILITY
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246636] p 3075 N92-28119
WHEELS
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms
p 3113 N92-27780
WHITE DWARF STARS
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636
WHITE NOISE
Frequency, amplitude, and phase tracking of nonsinusoidal signal in noise with extended Kalman filter
[AD-A246928] p 3090 N92-27508
WILDLIFE
Air pollution effects on biodiversity
[PB92-170166] p 3125 N92-28208
WIND (METEOROLOGY)
Implementations and analysis of foil chaff cloud measurements for the wind field in winter over northern Norway, at 75 up to 100 kilometers height
[BONN-IR-91-15] p 3128 N92-27420
Hindcast wave information for the great lakes: Lake Ontario
[AD-A246446] p 3135 N92-27820
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168
WIND SHEAR
Implementations and analysis of foil chaff cloud measurements for the wind field in winter over northern Norway, at 75 up to 100 kilometers height
[BONN-IR-91-15] p 3128 N92-27420
Experimental evaluation of candidate graphical microburst alert displays
[NASA-CR-189633] p 3047 N92-27424
The modelling of turbulence and downbursts for flight simulators
[ISBN-0-315-59945-6] p 3051 N92-27645
WIND TUNNEL APPARATUS
Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle p 3052 N92-27977
Estimation of cable-mounted model inertia characteristics for dynamic wind-tunnel test
[NAL-TM-641] p 3042 N92-28152
WIND TUNNEL MODELS
A wind tunnel study of the pioneer remotely piloted vehicle
[AD-A247028] p 3045 N92-27335
A pressure measurement method using Electronically Scanner Pressure sensors (ESP) installed in a gust wind tunnel
[NAL-TM-638] p 3051 N92-27428
Propulsion simulator for magnetically suspended wind tunnel models p 3052 N92-27801
Present status of the MIT/NASA Langley 6-inch MSBS p 3053 N92-27802
Wind tunnel magnetic Suspension Systems at the University of Southampton, England
p 3053 N92-27804
Investigation of the aeroelastic stability of the AFW wind-tunnel model using CAP-TSD p 3040 N92-27955
Estimation of cable-mounted model inertia characteristics for dynamic wind-tunnel test
[NAL-TM-641] p 3042 N92-28152
WIND TUNNEL NOZZLES
Effect of collector configuration on test section turbulence levels in an open-jet wind tunnel
[NASA-TM-4333] p 3051 N92-27670
WIND TUNNEL STABILITY TESTS
A wind tunnel study of the pioneer remotely piloted vehicle
[AD-A247028] p 3045 N92-27335
WIND TUNNEL TESTS
Turbulent heat flux measurements in a transitional boundary layer
[NASA-TM-105623] p 3035 N92-27377
An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399
A pressure measurement method using Electronically Scanner Pressure sensors (ESP) installed in a gust wind tunnel
[NAL-TM-638] p 3051 N92-27428
Propulsion simulator for magnetically suspended wind tunnel models p 3052 N92-27801
Present status of the MIT/NASA Langley 6-inch MSBS p 3053 N92-27802
Estimation of cable-mounted model inertia characteristics for dynamic wind-tunnel test
[NAL-TM-641] p 3042 N92-28152
Note on flight measured control effectiveness of the quiet STOL experimental aircraft ASKA
[NAL-TR-1103] p 3051 N92-28154
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190
A gust generation method for full configuration aircraft tests in a low speed wind tunnel. Part 1: Design and preliminary experiments
[NAL-TR-1115-PT-1] p 3043 N92-28192
WIND TUNNEL WALLS
Effect of collector configuration on test section turbulence levels in an open-jet wind tunnel
[NASA-TM-4333] p 3051 N92-27670
Further investigation of the effect of model cooling on periodic transonic flow p 3042 N92-27961
WIND TUNNELS
CFD contributions during hypersonic airplane intake design p 3098 N92-27472
Further investigation of the effect of model cooling on periodic transonic flow p 3042 N92-27961
WIND VELOCITY
Implementations and analysis of foil chaff cloud measurements for the wind field in winter over northern Norway, at 75 up to 100 kilometers height
[BONN-IR-91-15] p 3128 N92-27420
WING PANELS
Add-on damping treatment for life extension of the F-15 upper-outer wing skin
[AD-A246149] p 3050 N92-27577
Transonic wind tunnel investigation of limit cycle oscillations on fighter type wings p 3041 N92-27959
WINGS
Recent applications of linear and nonlinear unsteady aerodynamics for aeroelastic analysis
p 3038 N92-27940
A time-linearization approach for unsteady transonic flows p 3038 N92-27941
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations
p 3039 N92-27945
Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949
Transonic aeroelastic calculations in both the time and frequency domains p 3040 N92-27950
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow
p 3040 N92-27953
Transonic wind tunnel investigation of limit cycle oscillations on fighter type wings p 3041 N92-27959
A review of scale effects on surfaces in unsteady motion p 3042 N92-27962
WIRE
Magnetic suspension using high temperature superconducting cores p 3061 N92-27789
WORD PROCESSING
SLAC B Factory computing
[DE92-010745] p 3154 N92-27368
WORDS (LANGUAGE)
A proactive password checker
[NASA-CR-190438] p 3148 N92-27626
WORKING FLUIDS
Enhancement of boiling heat transfer in di-electric fluids
[AD-A245962] p 3105 N92-28058
WORKLOADS (PSYCHOPHYSIOLOGY)
A teamwork model of pilot aiding: Psychological principles for mission management systems design
p 3032 N92-27893
United States Coast Guard operational information systems: Improving functionality and cross-functionality
[AD-A246900] p 3184 N92-27917
WORKSTATIONS
From an automated flight-test management system to a flight-test engineer's workstation p 3035 N92-27907
WRIST
Precise positioning and compliance synthesis for automatic assembly using Lorentz levitation
p 3062 N92-27797

X

X RAY ANALYSIS
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps
p 3193 N92-27256
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257
X RAY BINARIES
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27636
X RAY IRRADIATION
Transport in ultra-dense plasmas produced by a picosecond laser pulse
[AD-A247827] p 3174 N92-27921
X RAY SCATTERING
X ray scattering studies of polyimide thin films from poly(amic acid)s functionalized with a methacrylate
[DE92-010120] p 3075 N92-27364
X RAY SPECTROSCOPY
Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292
Interaction of atomic oxygen with thin film and bulk copper: An XPS, AES, XRD, and profilometer study
p 3166 N92-27302
An XPS study of the formation of thin Pt and Ir silicide overlayers on Si (100) 2 x 1 surfaces
[AD-A245929] p 3178 N92-28165
X RAYS
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640
XENON CHLORIDE LASERS
A comparison of the measured and modelled effects of brewster angle anisotropies upon pulsed XeCl excimer laser output
[ISBN-0-315-49569-3] p 3109 N92-27698

Y

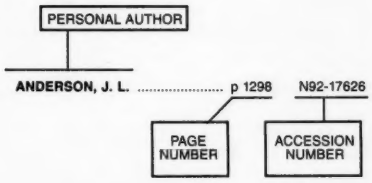
YAG LASERS
Large second-harmonic response of C60 thin films
[AD-A248957] p 3092 N92-28080

YAW
Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment
p 3192 N92-27253
YIELD STRENGTH
Correlation between fracture toughness, Charpy V-notch impact energy, and yield strength for ASTM A723 steel
[AD-A249142] p 3075 N92-28143
YTTRIUM COMPOUNDS
Levitation of YBa2Cu3O(7-x) superconductor in a variable magnetic field p 3059 N92-27735
YTTRIUM OXIDES
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C
[AD-A247880] p 3071 N92-27514
Application of ceramic superconductors in high speed turbines p 3061 N92-27791
Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012
Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials
[AD-A248736] p 3078 N92-28126
High performance YBCO films
[AD-A246802] p 3093 N92-28130

Z

ZIRCONATES
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C
[AD-A247880] p 3071 N92-27514
ZIRCONIUM OXIDES
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C
[AD-A246407] p 3069 N92-27752
ZODIACAL LIGHT
New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267
Visual photometric experiment data processing system
[AD-A248657] p 3044 N92-27964

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The page number helps you locate the citation in the abstract section. The accession number denotes the number by which the citation is identified.

A

ABOLFADL, MOHAMED A. ..... p 3049 N92-27461
ABOU-HAIDAR, N. I. ..... p 3099 N92-27480
ABRAHAM, JACOB A. ..... p 3145 N92-27211
ACHILLE, LISA B. ..... p 3139 N92-27535
ADAM, V. ..... p 3033 N92-27897
ADAMCZYK, J. J. ..... p 3095 N92-27458
ADAMS, GENE W. ..... p 3130 N92-27696
ADAMS, JAMES H., JR. ..... p 3165 N92-27240
p 3166 N92-27329
ADAMS, R. J. ..... p 3043 N92-28052
ADES, MICHEL ..... p 3160 N92-28140
ADLER, ROBERT J. ..... p 3159 N92-27334
AGARONYAN, F. A. ..... p 3195 N92-27493
AGUERO, RENE C. ..... p 3193 N92-27267
AHEARN, J. S. ..... p 3178 N92-27319
AJAYI, O. O. ..... p 3110 N92-27410
AKMANDOR, I. SINAN ..... p 3098 N92-27473
AKOPOVA, A. B. ..... p 3195 N92-27494
ALANI, R. ..... p 3069 N92-27856
ALBRECHT, A. ..... p 3165 N92-27239
ALCORN, CHARLES ..... p 3053 N92-27802
ALDRIDGE, HAL ..... p 3155 N92-27768
ALGEO, M. E. A. ..... p 3150 N92-27923
ALLAIRE, P. E. ..... p 3057 N92-27723
p 3059 N92-27739
ALLAIRE, PAUL E. ..... p 3060 N92-27745
ALLAN, A. PETER ..... p 3058 N92-27732
ALLBROOKS, MARTHA ..... p 3192 N92-27246
ALLEN, CHERYL L. ..... p 3152 N92-27778
ALLEN, J. F. ..... p 3181 N92-27590
ALLEN, JAMES F. ..... p 3151 N92-28082
ALLEN, JOHN S. ..... p 3135 N92-28010
ALMER, J. D. ..... p 3161 N92-27411
ALSTON, JIM A. ..... p 3136 N92-27323
AMARI, S. ..... p 3193 N92-27259
AMES, ARLO L. ..... p 3154 N92-27748
ANAND, D. K. ..... p 3057 N92-27728
ANAND, DAVINDER K. ..... p 3062 N92-27798
ANANTHAPADMANABHAN, P. V. ..... p 3078 N92-28159
ANDERSON, B. L. ..... p 3166 N92-27365
ANDERSON, BERNHARD H. ..... p 3042 N92-28102
ANDERSON, IVER E. ..... p 3074 N92-27619
ANDREWS, G. A. ..... p 3093 N92-28137
ANDREWS, HAROLD ..... p 3046 N92-27870
ANDREWS, ROBERT J. ..... p 3058 N92-27734
ANGEL, S. M. ..... p 3166 N92-27365
ANGUS, WILLIAM J. ..... p 3048 N92-27206
ANHORN, WALTER ..... p 3053 N92-27530
APPLEGATE, CAROLYN L. ..... p 3114 N92-27602
ARBUCKLE, P. DOUGLAS ..... p 3032 N92-27892
ARDALAN, SASAN H. ..... p 3083 N92-27520
ARDITTY, HERVE J. ..... p 3087 N92-28092
ARMSTRONG, T. W. ..... p 3164 N92-27229
p 3165 N92-27232
p 3165 N92-27235
p 3165 N92-27236
p 3165 N92-27237
p 3165 N92-27242
ARNAL, D. ..... p 3037 N92-27711
ARNOLD, DAVID ..... p 3119 N92-27559
ARNOLDUS, HENK F. ..... p 3170 N92-28125
ARRAS, MICHAEL K. ..... p 3155 N92-27770
ARTHUR, RICHARD J. ..... p 3196 N92-27224
ASCHWANDEN, MARCUS J. ..... p 3194 N92-27935
ASHCROFT, R. W. ..... p 3085 N92-28005
ASHRAFI, S. ..... p 3194 N92-28221
ASKARI, F. ..... p 3121 N92-28023
ASKINS, D. R. ..... p 3111 N92-27996
ATKINSON, DALE R. ..... p 3192 N92-27246
p 3128 N92-27265
p 3171 N92-27311
AUDENINO, MARIO ..... p 3031 N92-27890
AYERS, JACK D. ..... p 3074 N92-27619
AYGUN, HUSEYIN ..... p 3181 N92-27681
AYKAC, ERKAN ..... p 3145 N92-27333

B

BABA, SHIGEO ..... p 3042 N92-28151
p 3042 N92-28190
BACHER, ANDREAS ..... p 3128 N92-27420
BADER, S. D. ..... p 3176 N92-27345
BAILEY, B. K. ..... p 3072 N92-28207
BAILEY, K. A. ..... p 3125 N92-27571
BAIRI, B. R. ..... p 3184 N92-27497
BAKER, FRANK W. ..... p 3130 N92-27912
BAKER, JOHN ..... p 3076 N92-27539
BALENDRA, ANUSHIA ..... p 3169 N92-27873
BANDOU, TOSHIO ..... p 3046 N92-28153
p 3051 N92-28154
p 3047 N92-28191
BANERJEE, BIBHUTI B. ..... p 3060 N92-27745
BANKS, BRUCE A. ..... p 3079 N92-27281
BANKS, P. ..... p 3055 N92-27388
BARCLAY, REBECCA O. ..... p 3185 N92-28113
p 3186 N92-28115
p 3186 N92-28116
p 3186 N92-28155
p 3186 N92-28183
p 3187 N92-28184
p 3187 N92-28211
p 3187 N92-28220
BARKER, J. R. ..... p 3125 N92-28208
BARLOW, LINDA S. ..... p 3143 N92-27991
BARNA, P. STEPHEN ..... p 3051 N92-27670
BARRERA, E. V. ..... p 3074 N92-27913
BARRETT, FRANK J. ..... p 3180 N92-27528
BARRETT, L. E. ..... p 3063 N92-27799
BARRETT, LARRY K. ..... p 3182 N92-27972
BARRY, ROBERT K. ..... p 3182 N92-27754
BARRY, S. E. ..... p 3089 N92-27366
BARTA, DANIEL J. ..... p 3144 N92-28157
BARTH, TIMOTHY J. ..... p 3103 N92-27677
BATHA, H. D. ..... p 3069 N92-27761
BATINA, JOHN T. ..... p 3038 N92-27938
BATRA, ROMESH C. ..... p 3077 N92-27545
BAY, FREDERICK M. ..... p 3067 N92-27627
BAYRAMOGLU, SULEYMAN ..... p 3152 N92-28163
BAZAJ, SURESH ..... p 3182 N92-27972
BAZIGOS, MICHAEL ..... p 3067 N92-27627
BEADLES, JOSEPH W., III ..... p 3183 N92-28172
BEAHM, LORRAINE P. ..... p 3165 N92-27240
BECK, JACOB ..... p 3142 N92-28176
BEEM, DONALD R. ..... p 3065 N92-27862
BEIER, E. W. ..... p 3194 N92-27415
BEITELMAN, ALFRED D. ..... p 3076 N92-27539
BELL, KAMIN A. ..... p 3184 N92-27885
BENEDETTO, S. ..... p 3167 N92-27596
BENNETT, J. ..... p 3046 N92-28118
BENNETT, ROBERT M. ..... p 3040 N92-27955
p 3041 N92-27960
BENTON, CHARLES J. ..... p 3052 N92-27836
BENTON, E. R. ..... p 3165 N92-27233
BENTON, E. V. ..... p 3165 N92-27232
p 3165 N92-27233
p 3165 N92-27234
p 3165 N92-27235
BENZ, ARNOLD O. ..... p 3194 N92-27935
BERGERON, C. A. ..... p 3071 N92-27634
BERGMAN, AVIV ..... p 3157 N92-27987
BERGMAN, LARRY A. ..... p 3171 N92-27316
BERKEY, FRANK T. ..... p 3127 N92-27434
BERLAM, GARY R. ..... p 3054 N92-27628
BERNHARD, RONALD P. ..... p 3193 N92-27256
p 3193 N92-27257
BERRIOS, WILLIAM M. ..... p 3179 N92-27221
BERRY, J. N. ..... p 3171 N92-27315
BERTRAND, DENIS J. ..... p 3050 N92-27505
BEST, GREGORY D. ..... p 3182 N92-27979
BEST, S. G. ..... p 3192 N92-27250
BETANCOURT, O. ..... p 3174 N92-28057
BETTENCOURT, JOSEPH A. ..... p 3138 N92-28135
BHADAURIA, Y. S. ..... p 3183 N92-27496
BHAT, M. V. ..... p 3099 N92-27477
BHUVA, BHARAT ..... p 3106 N92-27993
BIBEAU, GARY ..... p 3167 N92-27435
BICHSEL, J. ..... p 3061 N92-27793
BIEDERMAN, IRVING ..... p 3140 N92-27825
BIETERMAN, M. B. ..... p 3040 N92-27953
BIKKER, S. ..... p 3099 N92-27479
BILLINGSLEY, JAMES P. ..... p 3177 N92-27607
BIRCH, N. T. ..... p 3095 N92-27457
p 3098 N92-27471
BIRDSALL, C. K. ..... p 3171 N92-27330
BISHOP, ALEXANDER W. ..... p 3082 N92-27506
BISHOP, ANN P. ..... p 3167 N92-28211
BISHOP, MATT ..... p 3147 N92-27560
p 3147 N92-27561
p 3148 N92-27626
BISSINGER, N. C. ..... p 3098 N92-27472
BISSONNETTE, LAURENT C. ..... p 3054 N92-27628
BITSAKIS, NICHOLAS ..... p 3054 N92-27628
BLACKWELDER, RON F. ..... p 3037 N92-27712
BLAIR, M. ..... p 3038 N92-27939
BLAKE, J. B. ..... p 3165 N92-27230
BLAKEMORE, JOHN S. ..... p 3177 N92-27632
BLAKKOLB, BRIAN K. ..... p 3170 N92-27308
BLEULER, H. ..... p 3060 N92-27743
BLOOM, A. ..... p 3121 N92-28027
BLUE, M. D. ..... p 3170 N92-27306
BLUM, EDWARD K. ..... p 3158 N92-28061
BODEN, KARL ..... p 3062 N92-27794
BODYCOAT, PETER R. ..... p 3054 N92-27628
BOHNHOFF-HLAVACEK, GAIL ..... p 3188 N92-27270
BOND, N. R. ..... p 3050 N92-27484
BONNEMASON, FRANCIS ..... p 3107 N92-27312
BOONE, JOHN M. ..... p 3185 N92-28040
BORG, J. ..... p 3193 N92-27260
BORISOV, SERGEY YU. ..... p 3052 N92-27792
BORLAND, C. J. ..... p 3040 N92-27953
BORSON, EUGENE N. ..... p 3073 N92-27298
BOSCH, J. ..... p 3196 N92-27241
BOSSI, RICHARD H. ..... p 3074 N92-28053
BOUDIER, P. ..... p 3073 N92-27486
BOULANGER, BRUNO ..... p 3141 N92-27971
BOURASSA, R. J. ..... p 3066 N92-27220
BOURGEAU-CHAVEZ, LAURA L. ..... p 3119 N92-28015
p 3119 N92-28016
BOURGOIS, G. ..... p 3102 N92-27675
BOURRIEAU, J. ..... p 3165 N92-27231
BOWEN, HOWARD ..... p 3170 N92-27308
BOWERS, EARL C. ..... p 3162 N92-27202
BOWMAN, STEVEN R. ..... p 3108 N92-27617
BOWYER, M. R. ..... p 3034 N92-27904
BOYD, ANDREW D. ..... p 3044 N92-28132
BOYD, LOUIS ..... p 3189 N92-27651
BOYD, RONALD ..... p 3182 N92-27972
BRADLEY, J. ..... p 3193 N92-27258
BRADY, ROBERT F., JR. ..... p 3077 N92-27618
BRADY, TERRANCE C. ..... p 3180 N92-27440
BRANSTETTER, M. L. ..... p 3145 N92-27367
BRAY, ROBERT M. ..... p 3045 N92-27335
BREDTHAUER, DENNIS ..... p 3044 N92-28133
BREITMEYER, BRUNO G. ..... p 3141 N92-27910
BRENNAN, PATRICK J. ..... p 3106 N92-27317
BRENNEIS, A. ..... p 3039 N92-27945
BREWER, MACK L. ..... p 3153 N92-27605
BRIGGS, B. MIKE ..... p 3065 N92-27811
BRIGHTBILL, PATRICIA L. ..... p 3150 N92-27868
BRILEY, W. R. ..... p 3093 N92-28137
BRININSTOOL, MICHAEL R. ..... p 3169 N92-27838
BRINKER, DAVID J. ..... p 3124 N92-27320

BRISCO, B. p 3120 N92-28019
BRITCHER, COLIN P. p 3056 N92-27721
p 3057 N92-27724
p 3061 N92-27788
p 3065 N92-27816
BRITTON, THOMAS C. p 3065 N92-27816
BRODZINSKI, RONALD L. p 3196 N92-27224
BROSI, FRED p 3182 N92-27972
BROSNAHAN, JOHN W. p 3130 N92-27696
BROWN, C. S. p 3136 N92-27877
BROWN, D. R. p 3147 N92-27570
BROWN, GARY S. p 3085 N92-27970
BROWN, GERALD V. p 3062 N92-27795
BROWN, R. J. p 3120 N92-28019
BROWN, RAY B., JR. p 3163 N92-27998
BROWNING, JUDY A. p 3147 N92-27569
BROWNLEE, D. E. p 3193 N92-27258
BRUCE, SCOTT A. p 3142 N92-27350
BRUMBAUGH, R. W. p 3035 N92-27907
BRUNO, RONALD C. p 3055 N92-28219
BRYANT, PAUL T. p 3169 N92-27999
BU, YUE p 3177 N92-28077
BUCKNAM, R. D. p 3087 N92-28103
BUCKNELL, MARY p 3084 N92-27758
BUEHLER, F. p 3145 N92-27266
BUNCH, T. E. p 3193 N92-27260
p 3073 N92-27262
BURCHAM, FRANK W., JR. p 3048 N92-27587
BURKHALTER, P. G. p 3174 N92-27921
BURNS, DANIEL J. p 3144 N92-28063
BURROWS, C. R. p 3063 N92-27800
BUSHKO, DARIUSZ A. p 3065 N92-27815
BUSHNELL, D. M. p 3036 N92-27709
BUSSOLETTI, J. E. p 3040 N92-27953
BUTLER, TODD F. p 3187 N92-28188
BYERS, JAMES H. p 3152 N92-28106

C

CAGLE, J. A. p 3066 N92-27325
CAI, ZHONG p 3080 N92-27744
CAIN, BRAD p 3144 N92-28166
CALLEN, W. RUSSELL p 3178 N92-27313
CALVERT, W. J. p 3094 N92-27452
CAMBIER, LAURENT p 3050 N92-27462
CAMMARATA, ROBERT C. p 3077 N92-27837
CAMPBELL, PHILIP p 3154 N92-27748
CANDEL, S. p 3073 N92-27486
CARABETIAN, C. p 3170 N92-27309
CARANDE, R. E. p 3088 N92-28024
CARIGNAN, FOREST J. p 3107 N92-28217
CARLBERG, INGRID A. p 3058 N92-27734
CARLSON, TOBY N. p 3128 N92-27336
CARNES, M. R. p 3134 N92-27575
CARRERE, V. p 3123 N92-28036
CARSTENS, V. p 3039 N92-27944
CASE, A. M. p 3033 N92-27898
CASEY, C. p 3115 N92-28055
CASSADY, CAROLYN J. p 3164 N92-28008
p 3072 N92-28009
CAUDLE, MARK D. p 3114 N92-27760
CELEUX, GILLES p 3148 N92-27661
CESPEDES, EMESTO R. p 3151 N92-28006
CHALOUPKA, T. p 3192 N92-27250
CHAMITOFF, GREGORY ERROL p 3051 N92-28209
CHAMPETIER, ROBERT J. p 3171 N92-27311
CHANA, K. S. p 3050 N92-27466
CHANG, A. C. p 3079 N92-27282
CHANG, R. P. p 3178 N92-28081
CHANG, TOM p 3127 N92-27963
CHANLEY, RICHARD C. p 3082 N92-27506
CHAPMAN, S. P. p 3171 N92-27315
CHAPMAN, W. L. p 3128 N92-27425
CHAPPELL, ALAN R. p 3032 N92-27892
CHASTAIN, ROBERT L. p 3142 N92-28179
CHATTERJEE, U. K. p 3078 N92-28159
CHATZITHEODOREDIS, E. p 3165 N92-27284
CHAVIAROPOULOS, P. p 3098 N92-27470
CHEN, C. T. p 3060 N92-27747
CHEN, CHIH-LYEU p 3109 N92-27203
CHENG, VICTOR H. L. p 3032 N92-27894
CHIANG, C. H. p 3101 N92-27546
CHILDS, R. E. p 3105 N92-27986
CHILINGARYAN, A. A. p 3195 N92-27493
CHIMA, RODRICK V. p 3097 N92-27467
CHOKANI, NDAONA p 3104 N92-27880
CHONG, PAUL p 3065 N92-27814
CHOUDHURY, S. ROY p 3175 N92-28205
CHOW, L. p 3059 N92-27736
CHRISTENSEN, NORMAN L., JR. p 3119 N92-28015
CHRISTL, LIGIA C. p 3166 N92-27302
CHU, JASON C. p 3177 N92-28077
CHU, W. K. p 3059 N92-27736
p 3061 N92-27791
CHUBB, S. R. p 3121 N92-28023
CLADIS, J. B. p 3127 N92-27594
CLARK, GARD J. p 3180 N92-27526
CLARK, NANCY K. p 3145 N92-27215
CLEAK, J. G. E. p 3095 N92-27457
CLEMONS, DOUG A. p 3148 N92-27584
CLINE, HELMUT P. p 3066 N92-28213
COCHRAN, ROLAND p 3068 N92-27383
COELHO, EMANUEL F. p 3136 N92-28108
COELHO, P. J. p 3098 N92-27476
COFFEY, H. T. p 3065 N92-27813
COGGI, J. M. p 3192 N92-27245
p 3078 N92-27273
p 3078 N92-27275
COLBORN, B. L. p 3164 N92-27229
p 3165 N92-27232
p 3165 N92-27235
p 3165 N92-27236
p 3165 N92-27237
p 3165 N92-27242
COLICK, JOSEPH F. p 3080 N92-27492
COLLIN, H. L. p 3127 N92-27594
COLLINS, C. B. p 3107 N92-27438
COMBES, J. F. p 3097 N92-27465
COMERFORD, LAWRENCE W. p 3073 N92-27332
COMMANDEUR, COLIN p 3065 N92-27814
COMPTON, RICHARD C. p 3093 N92-28141
CONLEE, DON T. p 3118 N92-27214
CONNORS, SEAN M. p 3177 N92-27983
COOKE, WILLIAM J. p 3192 N92-27253
p 3192 N92-27254
COOMBS, CASSANDRA R. p 3192 N92-27246
p 3128 N92-27265
COOPER, A. B., III p 3158 N92-27834
COOPER, A. L. p 3121 N92-28023
COOPER, ERIC G. p 3156 N92-27775
COOPER, JOHN H. p 3088 N92-27204
COOPER, PAUL p 3057 N92-27726
COPE, DAVID B. p 3064 N92-27805
CORD, GREGORY A. p 3108 N92-27659
CORNELL, D. R. p 3087 N92-28100
CORNETTE, JAMES B. p 3089 N92-27353
CORNWALL, J. M. p 3055 N92-27388
CORREDOURA, P. p 3166 N92-28174
CORRIVEAU, PAUL p 3052 N92-27836
COURTRIGHT, E. L. p 3071 N92-27514
COUSTEIX, JEAN p 3036 N92-27707
COUSTOLS, E. p 3037 N92-27714
CRANE, JERRY A. p 3160 N92-27852
CROMWELL, BRIAN K. p 3170 N92-27295
CROSIGNANI, BRUNO p 3086 N92-28088
CROSS, S. A. p 3034 N92-27904
CROUT, DICK p 3134 N92-27604
CROWELL, LAWRENCE B. p 3128 N92-27265
CRUTCHER, E. R. p 3078 N92-27272
p 3073 N92-27297
CSIGE, I. p 3165 N92-27233
p 3165 N92-27234
p 3165 N92-27235
CUENCA, P. V. p 3034 N92-27903
CULAS, DONALD E. p 3148 N92-27585
CULSHAW, BRIAN p 3086 N92-28091
CUMMING, IAN G. p 3088 N92-28033
CUNNINGHAM, A. M., JR. p 3041 N92-27958
CUNNINGHAM, ATLEE M., JR. p 3041 N92-27959
CURLISS, DAVID B. p 3068 N92-27531
CUSHMAN, W. B. p 3142 N92-28164
CZARNIK, ANTHONY W. p 3077 N92-27704

D

DAANEN, H. A. M. p 3137 N92-27361
DAGG, JAMES M. p 3157 N92-27980
DAHER, MARY A. p 3181 N92-27553
DAMAREN, CHRISTOPHER JOHN p 3056 N92-27612
DANA, V. p 3072 N92-28064
DANIELS, TAUMI p 3053 N92-27802
DANSBERRY, BRYAN E. p 3041 N92-27960
DANYLUK, S. p 3176 N92-27409
DARLING, DOUGLAS p 3102 N92-27653
DARRAH, SHIRLEY p 3069 N92-27761
DAU, K. p 3039 N92-27949
DAVIS, CHARLES A. p 3132 N92-27502
DAVIS, H. p 3060 N92-27747
DAVIS, HAROLD p 3065 N92-27814
DAVIS, JAMES D. p 3049 N92-28162
DAVIS, JOHN M. p 3188 N92-27271
DAVIS, MICHAEL p 3140 N92-27839
DAVIS, ROBERT E. p 3120 N92-28021
DAVIS, ROGER L. p 3097 N92-27468
DAWSON, JAY p 3086 N92-28085
DECKER, HARRY J. p 3111 N92-27879
DECKER, MICHAEL p 3163 N92-27421
DECONINCK, H. p 3102 N92-27675
p 3103 N92-27678
p 3103 N92-27680
DEGRANDI, G. p 3122 N92-28028
p 3088 N92-28035
DEGROH, KIM K. p 3079 N92-27281
DEGROOF, H. p 3122 N92-28028
p 3088 N92-28035
DEHAINAUT, LINDA L. p 3170 N92-27307
DEHOFF, P. H. p 3089 N92-27404
DEJONG, F. J. p 3091 N92-27759
DEKORVIN, ANDRE p 3181 N92-27572
DELABOUINERE, J. P. p 3170 N92-27309
DELANEY, DANIEL E. p 3147 N92-27544
DELORENZO, ROBERT J. p 3137 N92-27844
DEMARCHIS, G. p 3086 N92-28086
DEMEO, MARTHA E. p 3155 N92-27771
DEMERATH, LOREN p 3186 N92-28115
DENBOER, RUUD G. p 3041 N92-27959
DENER, C. p 3050 N92-27464
DENERIS, C. A. p 3083 N92-27565
DENG, JUN YUAN p 3127 N92-27434
DENLINGER, EDGAR J. p 3093 N92-28130
DEROCHEMONT, L. PIERRE p 3058 N92-27734
DEROME, JACQUES p 3126 N92-27355
p 3128 N92-28201
DEROSA, JOSEPH K. p 3033 N92-27899
DERRICKSON, J. H. p 3165 N92-27233
DESBOIS, M. p 3031 N92-27891
DESCHAMBAULT, R. L. p 3103 N92-27683
DESOUZANETO, JOSE B. p 3162 N92-28146
DEUTSCH, S. p 3052 N92-27753
DEWALT, S. A. p 3171 N92-27314
DHAR, D. p 3063 N92-27799
DIEBEL, DEAN L. p 3090 N92-27513
DIEBOLT, JEAN p 3148 N92-27661
DIETZ, JOHN B. p 3121 N92-28026
DILLIES, B. p 3073 N92-27486
DION, MARC p 3148 N92-27663
p 3085 N92-27858
DIONNE, J. G. G. p 3181 N92-27703
DIVINE, NEIL p 3193 N92-27267
DIWAKAR, M. P. p 3184 N92-27497
DOBSON, M. CRAIG p 3119 N92-28015
p 3119 N92-28017
DODD, KENNETH T. p 3143 N92-27990
DOGGETT, WILLIAM R. p 3145 N92-27776
DOLLINS, ANDREW B. p 3141 N92-28094
DOMINGO, C. p 3196 N92-27241
DORMAN, ROBERT V. p 3141 N92-27989
DORNEY, DANIEL J. p 3097 N92-27468
DORSEY, JOHN T. p 3155 N92-27772
DOW, JOHN D. p 3092 N92-27965
p 3178 N92-28218
DOWDING, ROBERT J. p 3069 N92-27819
DOWNER, JAMES R. p 3065 N92-27815
DOZIER, JEFF p 3120 N92-28021
DRELA, MARK p 3035 N92-27558
DRESCHEL, T. W. p 3136 N92-27877
DRIVER, DAVID B. p 3135 N92-27820
DROLSHAGEN, GERHARD p 3193 N92-27261
DRUMMOND, A. M. p 3035 N92-27344
DRUMMOND, J. E. p 3157 N92-27517
DRUMMOND, LANNY D. p 3046 N92-28002
DRUMMOND, MARK p 3189 N92-27651
DUAN, HONG-MIN p 3058 N92-27734
DUARTE, GEORGE M. p 3054 N92-27628
DUBOIS, PASCALE p 3120 N92-28022
DUDEK, H.-L. p 3032 N92-27895
DUDKIN, V. E. p 3195 N92-27494
DUGAS, BERNARD p 3127 N92-27642
DUKE, E. L. p 3035 N92-27907
DUPOIRIEUX, FRANCIS p 3101 N92-27490
DURDEN, S. p 3123 N92-28037
DURHAM, MICHAEL H. p 3041 N92-27960
DURIN, CHRISTIAN p 3193 N92-27256
p 3111 N92-27304
DURSCH, HARRY p 3070 N92-27290
p 3111 N92-27299
p 3079 N92-27303
p 3111 N92-27305
DUTOYA, D. p 3098 N92-27475
DUTRA, L. V. p 3088 N92-28029
DYSON, F. p 3055 N92-27388
DZAMBA, L. D. p 3043 N92-28052

E

EATON, PHILIP E. p 3080 N92-27562
EBERLE, A. p 3098 N92-27472
p 3039 N92-27945
EBERT, R. p 3159 N92-27406
EBRAHIMI, NADER p 3115 N92-28171
ECIJA, J. B. p 3034 N92-27903
ECKSTROM, CLINTON V. p 3041 N92-27960
EDELMAN, JOEL p 3079 N92-27303
EDWARDS, G. R. p 3075 N92-28136
EDWARDS, GARY p 3166 N92-27338

EDWARDS, JOHN W. ..... p 3037 N92-27937
EGGER, ROBERT A. ..... p 3105 N92-28058
ELAZAR, DAVID ..... p 3186 N92-28183
ELDER, R. L. ..... p 3049 N92-28073
ELGHOBASHI, S. E. ..... p 3101 N92-27546
ELSHAMY, M. ..... p 3159 N92-27588
ELWELL, D. ..... p 3047 N92-27973
ENGMAN, EDWIN T. ..... p 3120 N92-28020
EPSTEIN, A. H. ..... p 3049 N92-27817
ERDEMIR, A. ..... p 3110 N92-27410
EREMIC, JOHN C. ..... p 3151 N92-28049
ERFANY, B. ..... p 3090 N92-27656
ERRERA, M. ..... p 3098 N92-27475
ESCANDE, BEATRICE ..... p 3050 N92-27462
ESKER, BARBARA S. ..... p 3049 N92-27669
ESPARZA, V. ..... p 3115 N92-28055
ESPIRITU, RITA V. ..... p 3153 N92-27212
ESPY, P. J. ..... p 3071 N92-27835
ESTEN, GUY M. ..... p 3044 N92-27217
EUGSTER, O. ..... p 3145 N92-27266
EUSTER, CAREN K. ..... p 3143 N92-27990
EVANOFF, GEORGE A., JR. ..... p 3083 N92-27615
EVANS, B. T. ..... p 3157 N92-27437
EVANS, G. ..... p 3125 N92-28206
EVANS, R. D. ..... p 3169 N92-27826
EVEREST, A. W. ..... p 3047 N92-28004
EWING, ANDREW G. ..... p 3077 N92-27867
EYLER, DAVID E. ..... p 3082 N92-27400

F

FABRIKANT, J. I. ..... p 3136 N92-27349
FAGGION, PAOLO ..... p 3031 N92-27890
FAKIR, REDOUANE ..... p 3190 N92-27623
FALGOUT, R. ..... p 3146 N92-27391
FAN, J. C. ..... p 3108 N92-27566
p 3167 N92-27597
FANG, H. ELIOT ..... p 3154 N92-27748
FARABAUGH, E. N. ..... p 3167 N92-27599
FARAH, MARTHA J. ..... p 3139 N92-27509
p 3142 N92-28142
FARAN, KAREN J. ..... p 3115 N92-27573
FARMER, MOSES G. ..... p 3041 N92-27960
FARR, TOM G. ..... p 3088 N92-28025
FASOULAS, ARISTIDES I. ..... p 3087 N92-28134
FAWCETT, W. R. ..... p 3091 N92-27840
FECHETE, ANDREW ..... p 3090 N92-27662
FEINBERG, JACK ..... p 3168 N92-27716
FEINER, STEVEN ..... p 3154 N92-27389
FELBECK, DAVID K. ..... p 3070 N92-27289
FELDMAN, A. ..... p 3167 N92-27599
FELTON, W. ..... p 3125 N92-27846
FENN, RALPH C. ..... p 3058 N92-27733
FENSKE, G. R. ..... p 3110 N92-27410
FIELDING, E. ..... p 3121 N92-28027
FILIPPENKO, ALEXEI V. ..... p 3189 N92-27651
FINCKE-KEELER, MARGRET ..... p 3164 N92-27691
FINCKENOR, MIRIA M. ..... p 3079 N92-27280
FINK, PAMELA K. ..... p 3152 N92-28150
FISHER, YUVAL ..... p 3161 N92-27854
FISHMAN, G. J. ..... p 3188 N92-27227
p 3164 N92-27228
FLEMING, R. H. ..... p 3073 N92-27262
FONTANA, RICHARD R. ..... p 3064 N92-27805
FOOTE, J. ..... p 3193 N92-27259
FORD, D. G. ..... p 3159 N92-27205
FORD, DOUGLAS I. ..... p 3073 N92-27286
FORTSON, N. ..... p 3055 N92-27388
FOSS, COLBY A., JR. ..... p 3091 N92-27840
FOTEA, K. ..... p 3099 N92-27481
FOUNTAIN, G. G. ..... p 3176 N92-27381
p 3089 N92-27401
p 3176 N92-27402
FOURNIER, G. R. ..... p 3157 N92-27437
FOX, A. ..... p 3121 N92-28027
FOX, J. D. ..... p 3166 N92-28174
FRAIL, DALE A. ..... p 3189 N92-27644
FRAILEY, LISA E. ..... p 3130 N92-27787
FRANCOEUR, J. R. ..... p 3053 N92-27327
FRANK, A. L. ..... p 3165 N92-27232
p 3165 N92-27233
FREDRICKSON, G. L. ..... p 3075 N92-28136
FREEMAN, A. ..... p 3120 N92-28018
p 3123 N92-28037
FREEMAN, WALTER J. ..... p 3139 N92-27512
FRENCH, NANCY H. F. ..... p 3119 N92-28016
FRIEBELE, E. J. ..... p 3170 N92-28007
FRIGO, L. ..... p 3165 N92-27235
FRIGO, L. A. ..... p 3165 N92-27233
FRISTRUP, KURT M. ..... p 3181 N92-27553
FRITSCH, J. M. ..... p 3128 N92-27336
FROGNER, GARY R. ..... p 3162 N92-27532
FRUGE, KEITH J. ..... p 3066 N92-27198
FRY, LARRY L. ..... p 3118 N92-27554
FUCHS, W. K. ..... p 3145 N92-27211
FUGLSANG, DENNIS F. ..... p 3040 N92-27951
FUJIEDA, HIROTOSHI ..... p 3051 N92-27428
FUJITA, TOSHIMI ..... p 3051 N92-27428
FUJKI, NAHOMI M. ..... p 3161 N92-27638
FULLERTON, ALEXANDER WILLIAM ..... p 3189 N92-27684
FUZAK, C., JR. ..... p 3083 N92-27564

G

GAFFNEY, MONIQUE S. ..... p 3057 N92-27729
GAGLIO, ANTONIO ..... p 3031 N92-27890
GALECKI, DENNIS ..... p 3057 N92-27726
GALLAGHER, MICHAEL J. ..... p 3055 N92-27994
GAO, XIAOPING ..... p 3072 N92-28120
GARBUTT, K. ..... p 3052 N92-27801
GARCIA, GRAHAM A. ..... p 3089 N92-27445
GARCIAFOGEDA, P. ..... p 3039 N92-27946
GARDINER, PETER T. ..... p 3086 N92-28091
GARDNER, C. L. ..... p 3194 N92-27818
GARRETT, STEVEN L. ..... p 3169 N92-27838
GATES, MARK A. ..... p 3085 N92-28065
GATLIN, DONALD H. ..... p 3048 N92-27587
GAYLORD, THOMAS K. ..... p 3178 N92-27313
GEISS, J. ..... p 3145 N92-27266
GELARO, RONALD ..... p 3130 N92-27842
GELLER, MYER ..... p 3083 N92-27615
GENET, DAVID ..... p 3189 N92-27651
GENET, RUSSELL ..... p 3189 N92-27651
GEOHEGAN, D. B. ..... p 3171 N92-27362
GEORGE, G. A. ..... p 3079 N92-27287
GEORGE, PETE ..... p 3070 N92-27290
GEORGE, THOMAS F. ..... p 3170 N92-28125
GEORGESON, GARY E. ..... p 3074 N92-28053
GEORGIADIS, N. J. ..... p 3157 N92-27517
GEROLYMOS, GEORG A. ..... p 3096 N92-27460
GERTEISEN, EDGAR A. ..... p 3039 N92-27948
GHOFRANI, MEHRAN ..... p 3065 N92-27816
GHONIEM, AHMED F. ..... p 3071 N92-27853
GHOSH, DAVE ..... p 3113 N92-27780
GILBANK, PASCALE ..... p 3101 N92-27490
GILBERT, MICHAEL G. ..... p 3155 N92-27771
GILBERT, PAUL A. ..... p 3126 N92-27209
GILLINGHAM, KENT K. ..... p 3044 N92-27916
GILMORE, F. R. ..... p 3071 N92-27835
GILMOUR, J. D. ..... p 3165 N92-27284
GIRAULT, J. PH. ..... p 3057 N92-27725
GLASER, EVAN R. ..... p 3168 N92-27616
GLASSMAN, ARTHUR J. ..... p 3035 N92-27376
GLASSMAN, MYRON ..... p 3186 N92-28116
GLASSMAN, NANCI ..... p 3186 N92-28115
GLENN, SCOTT M. ..... p 3134 N92-27604
GLIDDEN, WILLIAM C. ..... p 3084 N92-27784
GLYNN, PETER W. ..... p 3160 N92-28140
p 3160 N92-28182
GOERTZ, D. E. ..... p 3060 N92-27747
GOLD, DAVID ..... p 3186 N92-28149
GOLDBERG, LEW ..... p 3169 N92-27999
GOLDBERG, LOUIS F. ..... p 3105 N92-27975
GOLDEN, JOHNNY L. ..... p 3078 N92-27277
GOLDEY, C. L. ..... p 3052 N92-27801
GOLDMAN, A. ..... p 3046 N92-28118
GOLDSTEIN, R. M. ..... p 3088 N92-28024
GONDHALEKAR, VIJAY ..... p 3065 N92-27815
GOODE, PHILIP ..... p 3194 N92-27841
GOODMAN, J. W. ..... p 3176 N92-27598
GOODMAN, JOSEPH W. ..... p 3167 N92-27608
GOODMAN, M. ..... p 3195 N92-27390
GOODMAN, P. J. ..... p 3031 N92-27888
GOODYER, M. ..... p 3052 N92-27801
GOODYER, MICHAEL J. ..... p 3053 N92-27804
GOOSEN, TED ..... p 3069 N92-27849
GOULAS, A. ..... p 3099 N92-27481
GOVINDAN, T. R. ..... p 3091 N92-27759
GRABLE, ROSS ..... p 3148 N92-27606
GRAEBEL, B. ..... p 3081 N92-27715
GRAHAM, AMY ..... p 3126 N92-28222
GRAHAM, M. ..... p 3110 N92-27410
GRAHAM, R. LYNN ..... p 3153 N92-27589
GRAHAM, TERENCE ARTHUR ..... p 3036 N92-27624
GRAMMER, H. L. ..... p 3075 N92-27296
GRAVINA, M. F. ..... p 3146 N92-27414
GRAY, HENRY F. ..... p 3092 N92-28000
GRAY, ROBERT E. ..... p 3095 N92-27455
GREEN, JAMES L. ..... p 3183 N92-28156
p 3192 N92-28185
p 3187 N92-28186
p 3088 N92-28187
p 3187 N92-28188
GREENE, RICHARD F. ..... p 3092 N92-28000
GREENE, RUSSELL A. ..... p 3152 N92-28104
GREENSFELDER, A. P. ..... p 3158 N92-28060
GREENWELL, E. N. ..... p 3071 N92-27514
GREGORY-SMITH, D. G. ..... p 3095 N92-27457
GREGORY, J. C. ..... p 3066 N92-27219
p 3165 N92-27239
GREGORY, JOHN C. ..... p 3078 N92-27278
p 3165 N92-27301
p 3166 N92-27302
GRIFFIS, D. P. ..... p 3192 N92-27255
GRIGSBY, DORIS K. ..... p 3136 N92-27322
GRIMM, W. ..... p 3034 N92-27902
GRISVAL, J. P. ..... p 3040 N92-27954
GROOM, NELSON J. ..... p 3056 N92-27721
p 3056 N92-27722
p 3061 N92-27788
p 3065 N92-27816
GROSSMAN, R. L. ..... p 3157 N92-27557
GROUND, JOHN R. ..... p 3130 N92-27845
GRUBIN, H. L. ..... p 3091 N92-27759
p 3093 N92-28137
GUAN, B. ..... p 3158 N92-27909
GUERRA, ABEL ..... p 3120 N92-28022
GUGLIELMO, EUGENE L. ..... p 3184 N92-27860
GUILLAUMON, JEAN-CLAUDE ..... p 3079 N92-27300
GURUSWAMY, GURU P. ..... p 3041 N92-27957
GUSE, J. A. ..... p 3145 N92-27367
GUTOWSKI, FRANCIS D. ..... p 3069 N92-27827
GYETVAY, S. R. ..... p 3192 N92-27245
p 3078 N92-27273

H

HAARMEYER, J. ..... p 3050 N92-27463
HABASHI, W. G. ..... p 3099 N92-27477
HADZIDAKIS, M. ..... p 3098 N92-27470
HAENEL, D. ..... p 3094 N92-27451
HAGER, JOHN W. ..... p 3118 N92-27554
HAH, CHUNILL ..... p 3096 N92-27459
HAHN, JOHN FREDERICK ..... p 3109 N92-27698
HALL, PHILIP ..... p 3105 N92-28062
HALL, STEPHEN W. ..... p 3067 N92-27878
HALLETT, W. L. H. ..... p 3071 N92-27634
p 3071 N92-27694
HALLUM, CHARLES E. ..... p 3110 N92-27629
HALSKI, D. J. ..... p 3034 N92-27906
HALVERSON, W. D. ..... p 3169 N92-27826
HAMELIN, ANTOINETTE ..... p 3072 N92-28120
HAMI, S. ..... p 3049 N92-28073
HAMMOND, RUSSELL E. ..... p 3089 N92-27398
HAMPTON, R. DAVID ..... p 3059 N92-27741
HANNA, THOMAS E. ..... p 3163 N92-28011
HANSMAN, R. JOHN ..... p 3047 N92-27424
HANSON, K. M. ..... p 3118 N92-28214
HARASGAMA, S. P. ..... p 3050 N92-27466
HARGROVE, WILLIAM T. ..... p 3114 N92-27649
HARMON, B. A. ..... p 3188 N92-27227
p 3164 N92-27228
HARRIS, MIKE J. ..... p 3047 N92-27925
HARRIS, T. M. ..... p 3038 N92-27939
HARRISON, CHARLES M. ..... p 3138 N92-28135
HARRISON, FENTON W. ..... p 3155 N92-27764
HARRISON, L. ..... p 3047 N92-27973
HARTMANN, G. ..... p 3099 N92-27478
HARTMAYER, RON ..... p 3171 N92-27316
HARVEY, GALE A. ..... p 3079 N92-27285
HASEGAWA, SATOSHI ..... p 3110 N92-27431
HASHIMOTO, TOMOYUKI ..... p 3067 N92-27430
HATTANGADY, S. V. ..... p 3176 N92-27402
HAULER, P. D. ..... p 3188 N92-28042
HAWKEY, TIMOTHY ..... p 3064 N92-27810
HAWKINS, J. D. ..... p 3134 N92-27575
HAYHOE, MARY M. ..... p 3138 N92-27958
HE, J. L. ..... p 3065 N92-27813
HE, Z. ..... p 3103 N92-27683
HEALD, S. M. ..... p 3074 N92-27913
HEKIMOGLU, M. K. ..... p 3184 N92-27911
HELLMAN, CHAN ..... p 3183 N92-28083
HELLSTERN, MARK J. ..... p 3162 N92-27751
HEMMINGER, CAROL S. ..... p 3070 N92-27293
HEMMINGER, JOHN C. ..... p 3109 N92-28051
HENAGER, C. H. ..... p 3071 N92-27514
HENDERSON, J. K. ..... p 3047 N92-27925
HENDERSON, MOREY M. ..... p 3184 N92-27536
HENKE, H. ..... p 3039 N92-27949
p 3040 N92-27952
HENKE, R. P. ..... p 3165 N92-27233
HENNINGER, DONALD L. ..... p 3144 N92-28157
HENSHALL, CONSTANCE A. ..... p 3076 N92-27491
HENSHAW, PHILIP D. ..... p 3106 N92-27385
HENSYL, J. ..... p 3047 N92-27973
HERMANN, ALLEN M. ..... p 3058 N92-27734
HERO, A. O. ..... p 3160 N92-27915
HERUTH, GREGORY A., SR. ..... p 3179 N92-27499
HERZOG, G. ..... p 3165 N92-27239
HERZOG, R. ..... p 3060 N92-27743
HESAARAKI, M. ..... p 3106 N92-28216
HESS, LAURA ..... p 3120 N92-28020
HEWETT, M. D. ..... p 3035 N92-27907
HIBNER, DAVID ..... p 3059 N92-27738
HICKEY, JOHN R. ..... p 3124 N92-27320

HIDSON, DAVID p 3143 N92-27664
HIET, TIMOTHY C. p 3082 N92-27506
HIGGINS, MARK A. p 3062 N92-27798
HILL, D. J. T. p 3079 N92-27287
HILL, DAVID R. p 3118 N92-27554
HILL, SYLVESTER p 3070 N92-27290
HILL, THOMAS R. p 3080 N92-28070
HINE, BUTLER p 3189 N92-27651
HINKLE, C. R. p 3136 N92-27877
HIROSE, AKIRA p 3171 N92-27446
p 3172 N92-27447
p 3172 N92-27448
p 3172 N92-27449
p 3172 N92-27579
p 3172 N92-27580
p 3173 N92-27581
p 3173 N92-27582
p 3173 N92-27648
p 3173 N92-27882
p 3173 N92-27883
p 3174 N92-28193
p 3174 N92-28194
p 3174 N92-28195
p 3175 N92-28196
p 3175 N92-28197
p 3175 N92-28198
p 3175 N92-28204
p 3175 N92-28205
HIRSCH, C. p 3050 N92-27464
HISLOP, DANIEL T. p 3046 N92-27982
HOBAN, FRANCIS T. p 3181 N92-27609
HOCEVAR, SUSAN P. p 3180 N92-27528
HOCHEDEZ, J. F. p 3170 N92-27309
HODARA, H. p 3086 N92-28087
HOEKSEMA, J. T. p 3194 N92-28059
HOEVER, JEFFREY P. p 3067 N92-27627
HOFFMAN, M. J. p 3033 N92-27898
HOGAN, TIMOTHY F. p 3130 N92-27842
HOLDEMAN, J. D. p 3049 N92-27652
HOLEMAN, ERNEST G. p 3047 N92-28004
HOLL, JUDITH A. p 3143 N92-28071
HOLLAND, DAVID M. p 3132 N92-27370
p 3133 N92-27547
HOLLAND, MAURITA PETERSON p 3186 N92-28155
p 3187 N92-28184
HOLLIS, R. L. p 3062 N92-27797
HOLMBERG, GERALD E. p 3166 N92-27373
HONGGAO, TANG p 3175 N92-27201
HOPP, T. H. p 3150 N92-27923
HOR, P. H. p 3059 N92-27736
HORTON, G. C. p 3050 N92-27466
HORWATH, T. G. p 3060 N92-27746
p 3064 N92-27807
HORZ, F. p 3193 N92-27257
p 3193 N92-27258
HOUNJET, M. H. L. p 3039 N92-27947
HOWALD, TERRANCE J. p 3181 N92-27553
HOYT, W. ANDES p 3066 N92-27403
HUBBARD, DAVID C. p 3140 N92-27863
HUBER, ALAN C. p 3047 N92-28004
HUBERTZ, JON M. p 3135 N92-27820
HUDSON, B. J. p 3151 N92-28048
HUDSON, JAMES G. p 3129 N92-27668
HUGHES, TERTIA M. C. p 3136 N92-28199
HUGHES, THOMAS J. R. p 3102 N92-27673
HULL, J. R. p 3161 N92-27411
HUMMEL, CHRISTIAN A. p 3195 N92-27405
HUMPHRIS, R. R. p 3057 N92-27723
p 3059 N92-27739
HUNT, W. p 3125 N92-28206
HUNTER, J. L. p 3192 N92-27255
HUNTER, N. p 3107 N92-28054
HURD, A. G. p 3087 N92-28103
HURLEY, DONNA L. p 3164 N92-27226
HUTTSELL, L. J. p 3038 N92-27939
HYMAN, SHELDON p 3110 N92-27629

I

IACOVIDES, H. p 3099 N92-27480
IEMMA, U. p 3038 N92-27942
IGLEHART, DONALD L. p 3160 N92-28182
IMAMOTO, S. S. p 3165 N92-27230
INFANTE, LEOPOLDO p 3189 N92-27686
INGEBOS, ANNE-MICHELLE p 3141 N92-27971
INMAN, DANIEL J. p 3062 N92-27795
IRWIN, BILLY J. p 3182 N92-27824
IRWIN, J. p 3166 N92-27413
ISACKS, B. p 3121 N92-28027
ISHIHARA, O. p 3173 N92-27883
p 3175 N92-28205
ISHIHARA, OSAMU p 3174 N92-28195
ISKRA, ANTON L. p 3052 N92-27792
ISOGAI, K. p 3041 N92-27956
ITOU, FUMIKO p 3051 N92-27428
IVANENKO, I. P. p 3195 N92-27495
IWASAKI, AKIHITO p 3051 N92-27428
IZUMI, YUTAKA p 3085 N92-28003

J

JACCARINO, VINCENT p 3109 N92-28131
JACKS, SANDRA S. p 3118 N92-27554
JACKSON, DOUGLAS, III p 3142 N92-28179
JAGGERS, CHRISTOPHER H. p 3078 N92-27275
JAGODA, JECHIAL I. p 3094 N92-27352
JAIN, ASHOK K. p 3163 N92-27210
JANSEN, F. p 3196 N92-27241
JARRETT, TERRY K. p 3131 N92-28039
JESSBERGER, E. K. p 3193 N92-27259
JIANG, XUDONG p 3164 N92-28105
JOFFE, BENJAMIN p 3062 N92-27796
JOHNSON, BRUCE G. p 3057 N92-27729
JOHNSON, BURGESS p 3092 N92-28067
JOHNSON, CLAES p 3102 N92-27672
JOHNSON, DEXTER p 3062 N92-27795
JOHNSON, E. A. p 3169 N92-27826
JOHNSON, F. T. p 3040 N92-27953
JOHNSON, M. Q. p 3075 N92-28136
JOHNSON, R. BARRY p 3169 N92-27871
JOHNSON, R. G. p 3057 N92-27728
JOHNSON, RICHARD E. p 3073 N92-27286
JOHNSTON, ALAN R. p 3171 N92-27316
JONES, DAVID W. p 3183 N92-27981
JONES, EVAN S. p 3050 N92-27200
JONES, GRAHAM p 3057 N92-27726
JONES, R. p 3046 N92-28118
JONES, RAY p 3187 N92-28220
JONES, SHARON MONICA p 3155 N92-27766
JORDAN, THOMAS p 3053 N92-27802
JOSEPH, JOHN E. p 3133 N92-27533
JOSHI, P. B. p 3052 N92-27801
JOVIC, SRBOLJUB p 3035 N92-27399
JUANG, JER-NAN p 3156 N92-27782
JUDD, JON p 3069 N92-27849
JUNG, YOUNG J. p 3146 N92-27387

K

KAELBERER, MONTE S. p 3084 N92-27717
KAHNEMAN, DANIEL p 3138 N92-27337
KAISER, J. A. C. p 3121 N92-28023
KALIL, FORD p 3055 N92-28219
KALMAN, R. F. p 3176 N92-27598
KALMAN, ROBERT F. p 3167 N92-27608
KAMENETZKY, RACHEL R. p 3079 N92-27280
KAMES, LARRY p 3069 N92-27849
KAMIJOU, KENJIROU p 3110 N92-27431
KAN, H. K. A. p 3078 N92-27273
KANDA, HIROSHI p 3042 N92-28151
p 3042 N92-28190
KAO, YA-CHEN p 3145 N92-27832
KAPOOR, KAMLESH p 3042 N92-28102
KAPP, J. A. p 3075 N92-28143
KARAGIANNIS, F. p 3098 N92-27470
KARIG, F. p 3125 N92-27846
KARRARI, M. p 3081 N92-27926
KARTHIKEYAN, J. p 3078 N92-28159
KASHANGAKI, THOMAS A. L. p 3115 N92-27375
KASHYAP, SATISH p 3085 N92-27858
KASISCHKE, ERIC S. p 3119 N92-28015
p 3119 N92-28016
KASSEL, PHILIP C., JR. p 3192 N92-27253
KATHEDER, K. p 3100 N92-27482
KATZ, I. N. p 3158 N92-28060
KAUFMAN, J. G. p 3075 N92-28139
KAWAMOTO, IWAO p 3042 N92-28190
KAYABA, SIGEO p 3043 N92-28192
KAZAKOS, D. p 3158 N92-27834
KAZOVSKY, L. p 3167 N92-27595
p 3167 N92-27596
KAZOVSKY, L. G. p 3108 N92-27566
p 3167 N92-27597
p 3176 N92-27598
KAZOVSKY, LEONID G. p 3167 N92-27608
KEEFE, L. R. p 3105 N92-27986
KEEGAN, R. p 3196 N92-27241
KEENE, MICHAEL L. p 3186 N92-28116
p 3187 N92-28184
KELLEHER, JAMES J. p 3084 N92-27855
KELLER, P. p 3125 N92-27846
KELLER, W. C. p 3121 N92-28023
KELLEY, GERALD T. p 3110 N92-27439
KELLIHER, WARREN C. p 3058 N92-27734
KELLMAN, LYLE p 3055 N92-27555
KELLOG, DAVID L. p 3047 N92-27925
KEMP, WILLIAM T. p 3171 N92-27311
KENDALL, MICHAEL R. p 3104 N92-27828
KENEMUTH, JOHN p 3170 N92-27307
KENNEDY, JOHN M. p 3185 N92-28112
p 3185 N92-28113
p 3186 N92-28115
p 3186 N92-28116
p 3186 N92-28155
p 3186 N92-28183
p 3187 N92-28184
p 3187 N92-28211
p 3187 N92-28220
KENNY, S. P. p 3113 N92-27780
KENNY, SEAN P. p 3156 N92-27781
KEOUGH, BRUCE p 3111 N92-27299
KERNS, SHERRA p 3106 N92-27993
KERSEY, ALAN D. p 3170 N92-28001
KESSLER, DONALD J. p 3193 N92-27264
KHOSLA, PREM K. p 3105 N92-28175
KICZA, M. E. p 3081 N92-28203
KIDA, TAKASHI p 3110 N92-27432
KIEREINYOUNG, KATHRYN S. p 3121 N92-28026
KIM, HONG-ON p 3067 N92-27521
KIM, I. p 3101 N92-27546
KIM, J. J. p 3037 N92-27713
KIM, JAY H. p 3116 N92-27865
KING, JOSEPH H. p 3183 N92-28156
KINNEY, J. H. p 3069 N92-27856
KINSER, DONALD L. p 3078 N92-27247
KIRK, GORDON p 3057 N92-27726
KIRK, J. A. p 3057 N92-27728
KIRK, JAMES A. p 3062 N92-27798
KIROL, L. p 3081 N92-27715
KITCHEN, E. H. p 3098 N92-27471
KLABUNDE, GARY W. p 3146 N92-27436
KLEB, WILLIAM L. p 3038 N92-27938
KLEIN, J. p 3165 N92-27239
p 3123 N92-28037
KLEIN, J. D. p 3120 N92-28018
KLEIN, J. E. p 3079 N92-27363
KLEIN, STANLEY A. p 3138 N92-27331
KLEPKO, ROBERT p 3084 N92-27695
KLEUSBERG, ALFRED p 3044 N92-28079
KNOLLE, ERNST G. p 3065 N92-27812
KNOSPE, C. R. p 3058 N92-27731
p 3063 N92-27799
KNOSPE, CARL R. p 3058 N92-27732
p 3059 N92-27741
p 3060 N92-27745
KNOTT, M. J. p 3040 N92-27950
KNOTT, W. M. p 3136 N92-27877
KOBLINSKY, CHESTER J. p 3187 N92-28186
KOCH, PAUL A. p 3046 N92-28123
KOH, SEUNG K. p 3115 N92-27213
KOHL, K. B. p 3072 N92-28207
KOHRS, R. p 3033 N92-27897
KONG, J. A. p 3119 N92-27559
p 3088 N92-28031
KONOPELKO, A. K. p 3195 N92-27493
KOONCE, JEFFERSON M. p 3052 N92-27836
KOONIN, S. p 3055 N92-27388
KORNHAUSER, MURRAY p 3069 N92-27819
KOSCHEL, W. p 3099 N92-27479
KOSHIMIZU, S. p 3074 N92-27875
KOSIC, TOM p 3170 N92-27308
KOSKIE, JOHN E. p 3104 N92-27757
KOVACOVA, ZUZANA p 3091 N92-27840
KREER, J. R. p 3081 N92-28203
KRESKOVSKY, J. P. p 3093 N92-28137
KRIEGEL, ELLEN K. p 3033 N92-27899
KROTKOV, ERIC p 3173 N92-27866
KRUSE, FRED A. p 3121 N92-28026
KUMAR, VIJAI p 3183 N92-27496
KUNZ, P. F. p 3154 N92-27368
p 3146 N92-27414
KUO, FENG-YU p 3135 N92-27666
KUZIN, A. V. p 3059 N92-27740
p 3053 N92-27803
KUZNETSOV, ANATOLIY A. p 3059 N92-27735
KVASLERUD, OLAV p 3153 N92-27525
KWOK, R. p 3088 N92-28034

L

LACAS, F. p 3073 N92-27486
LACCARINO, VINCENT p 3109 N92-28124
LACOR, C. p 3050 N92-27464
LACY, PAUL I. p 3110 N92-27851
LAGNADO, ISAAC p 3089 N92-27445
LAHAK, MARTINE p 3141 N92-27971
LAHER, R. R. p 3071 N92-27835
LAI, M. K. Y. p 3104 N92-27693
LAIRD, C. E. p 3188 N92-27227
p 3164 N92-27228
LAKSHMANAN, PREM KUMAR p 3056 N92-27646
LAMADE, JOHN D., II p 3179 N92-28107
LAMB, M. A. p 3059 N92-27736
p 3061 N92-27791

LANAGAN, M. T. p 3176 N92-27409
LANDOLT, J. p 3181 N92-27703
LANDY, R. J. p 3034 N92-27906
LANE, HELEN W. p 3138 N92-28212
LANGE, G. p 3193 N92-27259
LANGLAND, R. H. p 3131 N92-28168
LANGNAU, A. p 3167 N92-27419
LANGRY, K. p 3166 N92-27365
LANGSTON, CHARLES A. p 3126 N92-27380
LARSON, KEVIN P. p 3044 N92-27964
LARSON, R. G. p 3157 N92-27557
LARSONNEUR, R. p 3060 N92-27743
LAUB, JAMES p 3052 N92-27978
LAUNDER, B. E. p 3099 N92-27480
LAURIENTE, MICHAEL p 3188 N92-27222
LAVALLE, C. p 3122 N92-28028
LAVIGNA, THOMAS A. p 3066 N92-28213
LAWING, P. p 3052 N92-27801
LAWRENCE, ALBERT p 3161 N92-27854
LE, T. D. p 3070 N92-27294
LEATHERMAN, BRENT L. p 3154 N92-27441
LECUYER, PIERRE p 3160 N92-28140
LEE, B. H. K. p 3038 N92-27941
LEE, ELIZABETH M. p 3038 N92-27938
LEE, J. S. p 3121 N92-28023
LEE, JOHN N. p 3163 N92-27998
LEE, K. p 3077 N92-27592
LEE, MYUNG p 3079 N92-27292
LEFEVRE, HERVE C. p 3087 N92-28092
LEHNERT, WENDY G. p 3151 N92-28068
LEHOCZKY, JOHN P. p 3154 N92-27755
LEMEUR, ALAIN p 3050 N92-27469
LENNOX, JAMES p 3069 N92-27761
LEONARD, B. P. p 3157 N92-27517
LETTON, ALAN p 3079 N92-27283
LEUNG, CHUN M. p 3196 N92-28147
LEUTHAEUSSER, U. p 3033 N92-27901
LEVALLOIS, J. M. p 3050 N92-27484
LEVI, MARK W. p 3144 N92-28063
LEVINE, ARLENE S. p 3196 N92-27218
LEVINE, JOHN G. p 3152 N92-28169
LEVINE, S. R. p 3076 N92-27378
LEVRAEA, VINCENT p 3050 N92-27577
LEWIS, ANN P. p 3184 N92-27536
LEWIS, D. W. p 3057 N92-27723
LEWIS, NORRIS E. p 3048 N92-28093
LI, SHULONG p 3168 N92-27720
p 3093 N92-28121
LI, YI-FAN p 3168 N92-27625
LIBERTO, SAMUEL M. p 3147 N92-27576
LIN, CHARLES A. p 3131 N92-27341
p 3124 N92-27343
p 3124 N92-27359
p 3125 N92-28200
LIN, J. S. p 3075 N92-27364
LIN, M. C. p 3177 N92-28077
LIN, M. W. p 3059 N92-27736
p 3061 N92-27791
LIN, W. P. p 3092 N92-28080
LIND, D. L. p 3145 N92-27266
LIND, M. D. p 3178 N92-27268
LINTON, ROGER C. p 3078 N92-27279
LIPMAN, ROBERT R. p 3145 N92-27208
LIS, STEVEN A. p 3106 N92-27385
LISCINSKY, D. S. p 3049 N92-27652
LITTLE, FRANK BLANE p 3190 N92-27611
LITZINGER, THOMAS A. p 3080 N92-27631
p 3081 N92-28161
LIU, S. p 3092 N92-28080
p 3075 N92-28136
LOEHNER, RAINALD p 3103 N92-27679
LOFARO, RONALD JOHN p 3180 N92-27518
LOGAN, J. C. p 3083 N92-27565
LOGAN, RONALD T., JR. p 3170 N92-28181
LOKEN, CHRIS p 3191 N92-27701
LOKUTA, ROBERT S. p 3085 N92-27864
LONG, JUNSHENG p 3145 N92-27211
LONG, STEVEN R. p 3135 N92-27930
LONGMAN, RICHARD W. p 3156 N92-27782
LOPEZ-SWAFFORD, BRIAN p 3192 N92-28185
p 3088 N92-28187
LOU, Y. p 3088 N92-28024
LOUIE, ALOISIUS p 3085 N92-27858
LU, HSINHSI p 3116 N92-27643
LUCOVSKY, G. p 3089 N92-27401
LUEVANO, ANNETTA J. p 3074 N92-27821
LUTES, GEORGE p 3170 N92-28181
LYBANON, M. p 3145 N92-27382
LYNCH, GARY p 3140 N92-27538
LYNCH, HARRY J. p 3141 N92-28094
LYNCH, WILLIAM E. p 3140 N92-27537
LYON, I. C. p 3165 N92-27284

M

MA, K. B. p 3059 N92-27736
p 3061 N92-27791
MABEY, D. G. p 3042 N92-27961
p 3042 N92-27962
MACDONALD, G. p 3125 N92-27511
MACDOUGALL, J. D. p 3143 N92-27358
MACFARLANE, T. R. p 3149 N92-27697
MACIEJEWSKI, WENDELL C. p 3106 N92-27823
MACK, KIMBERLY S. p 3192 N92-27244
MACLEOD, GORDON CURTIS p 3189 N92-27700
MACPHERSON, R. W. p 3181 N92-27703
MAGRADZE, N. V. p 3195 N92-27494
MAJUMDAR, S. p 3123 N92-27392
MALEKI, LUTE p 3170 N92-28181
MALLON, JOSEPH J. p 3070 N92-27293
MALLORY, M. K. p 3079 N92-27363
MALONE, JOHN B. p 3037 N92-27937
MALONSON, M. R. p 3052 N92-27801
MANAK, DAVINDER K. p 3133 N92-27548
MANDEVILLE, JEAN-CLAUDE p 3192 N92-27243
MANHEIMER, W. M. p 3172 N92-27563
MANNING, STUART N. p 3083 N92-27660
MANTINI, M. J. p 3176 N92-27402
MANUEL, G. S. p 3051 N92-27670
MARINI, M. p 3095 N92-27454
MARKLEY, F. p 3158 N92-28210
MARKUNAS, R. J. p 3176 N92-27381
p 3089 N92-27401
p 3176 N92-27402
MARMORINO, G. O. p 3121 N92-28023
MARONI, VICTOR A. p 3058 N92-27734
MARSH, PETER S. p 3184 N92-27917
MARSHALL, FRANK P. p 3054 N92-27374
MARSHALL, SANDRA P. p 3158 N92-28144
MARSILIO, ROBERTO p 3100 N92-27487
MARTIN, J. R. p 3034 N92-27903
MARTIN, RAYMOND W. p 3075 N92-28119
MASAKOWSKI, YVONNE R. p 3163 N92-28011
MASKELL, DAWN M. p 3150 N92-27984
MASLEN, E. H. p 3059 N92-27739
MASON, JAMES B. p 3079 N92-27303
MASSARDO, A. p 3095 N92-27454
MASTRODDI, F. p 3038 N92-27942
MATHERS, C. D. p 3087 N92-28101
MATSUNO, KENICHI p 3042 N92-28151
MAYFIELD, TERRY p 3185 N92-28040
MAZZELLA, ANDREW J., JR. p 3044 N92-27964
MCARTHUR, TIMOTHY S. p 3151 N92-28069
MCCREIGHT, CRAIG p 3106 N92-27317
MCDERMOTT, K. A. p 3125 N92-27571
MCDONALD, CATHERINE W. p 3185 N92-28040
MCDONALD, KYLE p 3119 N92-28017
MCDONNELL, J. A. M. p 3192 N92-27249
MCDOWELL, JOHN K. p 3147 N92-27524
MCGARITY, JOHN O. p 3047 N92-28004
MCGAUGH, JAMES L. p 3140 N92-27538
MCGLOTHIN, CHARLES C., JR. p 3129 N92-27655
MCGRATH, STEVEN J. p 3087 N92-28129
MCGUIRE, ROBERT E. p 3088 N92-28187
MCINTOSH, ROY p 3106 N92-27317
MCIVER, ROBERT T., JR. p 3109 N92-28051
MCLANDRESS, CHARLES p 3126 N92-27355
p 3128 N92-28201
MCMANUS, JOHN W. p 3032 N92-27892
MCMICHAEL, C. K. p 3059 N92-27736
p 3061 N92-27791
MCMURRY, D. p 3121 N92-28027
MCWHORTER, ALAN L. p 3176 N92-27216
MEDWELL, J. O. p 3098 N92-27474
MEE, V. A. p 3031 N92-27888
MEHLMAN, G. p 3174 N92-27921
MEHM, WILLIAM J. p 3138 N92-28135
MEIJER, J. J. p 3041 N92-27958
MELL, RICHARD J. p 3070 N92-27274
p 3078 N92-27278
MELVIN, R. G. p 3040 N92-27953
MENG, R. L. p 3059 N92-27736
MENNE, S. p 3099 N92-27478
MENZIES, K. R. p 3050 N92-27484
MERROW, JAMES E. p 3192 N92-27252
MERTENS, HENRY W. p 3139 N92-27500
MESHISHNEK, M. J. p 3192 N92-27245
p 3078 N92-27273
p 3078 N92-27275
MESSA, K. p 3145 N92-27382
METCALF, JAMES I. p 3082 N92-27506
MEURZEC, J. L. p 3040 N92-27954
MEWALDT, RICHARD A. p 3196 N92-27876
MEYER, CHRIS D. p 3073 N92-27207
MEYER, R. P. p 3034 N92-27906
MICHALSKI, K. A. p 3085 N92-28066
MICHARD, P. J. p 3098 N92-27475
MICHAUD, REJEAN p 3131 N92-27341
MIDDLETON, R. p 3165 N92-27239
MIED, R. P. p 3121 N92-28023
MILES, E. p 3086 N92-28087
MILEY, G. H. p 3107 N92-27393
MILLER, BRADFORD W. p 3151 N92-28082
MILLER, EDGAR R. p 3070 N92-27274
p 3078 N92-27278
MILLER, GREGORY A. p 3092 N92-27884
MILLER, T. p 3088 N92-28024
MIRTICH, MICHAEL J. p 3192 N92-27252
MISRA, V. p 3192 N92-27254
p 3192 N92-27255
MITARAI, O. p 3173 N92-27883
MITARAI, OSAMU p 3173 N92-27882
p 3174 N92-28193
p 3174 N92-28194
MITCHELL, J. B. p 3072 N92-28145
MITCHELL, LIONEL p 3182 N92-27972
MITTA, DEBORAH A. p 3144 N92-28177
MIWA, HITOSHI p 3042 N92-28151
p 3042 N92-28190
MLADENOV, I. M. p 3179 N92-28215
MOEN, I. O. p 3181 N92-27703
MOISEENKO, A. A. p 3195 N92-27494
MOLLOY, JOHN K. p 3051 N92-27670
MONAHAN, JAMES G. p 3146 N92-27504
MONARSKI, T. W. p 3171 N92-27315
MONTGOMERY, EARL K. p 3076 N92-27491
MONTGOMERY, R. C. p 3113 N92-27780
MOODY, G. L. p 3080 N92-27418
MOON, HEE-KYUNG p 3074 N92-27542
MOORE, GARY p 3218 N92-28078
p 3218 N92-28096
p 3218 N92-28097
p 3219 N92-28098
p 3219 N92-28099
p 3219 N92-28109
p 3219 N92-28110
p 3219 N92-28111
p 3219 N92-28127
p 3219 N92-28128
MOORE, J. STROTHER p 3153 N92-27586
MOORE, JAMES D. p 3148 N92-27584
MOORE, JOAN G. p 3095 N92-27453
MOORE, JOHN p 3095 N92-27453
MORENCY, ROGER L. p 3166 N92-27373
MORGAN, K. p 3103 N92-27676
MORGAN, S. J. p 3178 N92-28165
MORINO, L. p 3038 N92-27942
MORRIS, A. TERRY p 3155 N92-27767
MORRIS, W. D. p 3098 N92-27474
MORRISON, B. J. p 3091 N92-27759
MOSS, CALVIN E. p 3164 N92-27225
MOTHEO, ARTHUR J. p 3091 N92-27840
MOTLEY, WILLIAM R., III p 3192 N92-27253
MOZO, BEN T. p 3143 N92-27991
MUELLER, J.-D. p 3103 N92-27680
MUELLER, U. R. p 3039 N92-27949
MULCAHY, T. M. p 3161 N92-27411
MULHOLLAND, J. DERRAL p 3192 N92-27253
p 3192 N92-27254
MURPHY, BARBARA A. p 3143 N92-27991
MURPHY, BRIAN P. p 3128 N92-28072
MURPHY, PEG p 3044 N92-27916
MURTY, H. S. p 3038 N92-27941
MUSTICO, ARTHUR p 3170 N92-27310
MYERS, MYRON G. p 3110 N92-27439
MYSAK, LAWRENCE A. p 3131 N92-27340
p 3132 N92-27342
p 3124 N92-27343
p 3132 N92-27356
p 3124 N92-27359
p 3132 N92-27370
p 3128 N92-27425
p 3129 N92-27427
p 3133 N92-27547
p 3133 N92-27548
p 3133 N92-27549
p 3125 N92-27641
p 3125 N92-28200

N

NADEAU, C. A. p 3194 N92-27818
NAGAYASU, MASAHIKO p 3042 N92-28152
NAIK, DIPAK p 3089 N92-27404
NARIMANOV, YE. A. p 3053 N92-27933
NATALE, A. A. p 3164 N92-27498
NEILSON, ROBERT H. p 3076 N92-27442
NELIK, LEV p 3057 N92-27726
NELSON, CHRIS p 3102 N92-27653
NEMAT-NASSER, S. p 3117 N92-28138
NESSETT, D. M. p 3145 N92-27367
NEUBAUER, JAY C. p 3044 N92-27916
NEURGAONKAR, R. R. p 3177 N92-27985

NEWCOMB, MARTIN p 3163 N92-27351
NEWMAN, D. A. p 3174 N92-27921
NEWMAN, S. C. p 3066 N92-27325
NEWMASTER, JEFFREY T. p 3169 N92-27838
NGUYEN, DUC T. p 3116 N92-27874
NGUYEN, L. p 3088 N92-28034
NGUYEN, TIEP H. p 3060 N92-27742
NGUYEN, V.-N. p 3099 N92-27477
NICHOLS, F. A. p 3110 N92-27410
NICHOLS, M. C. p 3069 N92-27856
NICHOLSON, H. p 3081 N92-27926
NICHOLSON, MARK p 3158 N92-28210
NIELSEN, K. F. p 3178 N92-27268
NIXON, D. p 3105 N92-27986
NOBILE, A., JR. p 3079 N92-27363
NOLL, B. p 3100 N92-27485
NORTHUP, ROBERT L. p 3089 N92-27398
NORTON, R. J. G. p 3098 N92-27471
NORWOOD, JOSEPH K. p 3079 N92-27280
NUNES, T. L. p 3075 N92-27364
NUTTALL, ALBERT H. p 3116 N92-27850
NYE, LENDELL G. p 3139 N92-27501

O

OAKES, CARLTON E. p 3058 N92-27734
OBAYASHI, SHIGERU p 3041 N92-27957
OBERHUBER, JOSEF M. p 3132 N92-27370
p 3133 N92-27547
ODA, K. p 3165 N92-27233
ODONNELL, J. H. p 3079 N92-27287
OGAWA, HIROYUKI p 3162 N92-27369
OKIISHI, THEODORE H. p 3048 N92-27519
OKTAY, ERDAL p 3098 N92-27473
OLIVER, JAMES M. p 3177 N92-27607
OLIVER, JOHN P. p 3192 N92-27253
p 3192 N92-27254
OMAN, HENRY p 3065 N92-27811
ONG, T. P. p 3178 N92-28081
ONKEN, R. p 3032 N92-27895
ONNO, R. p 3035 N92-27344
ONO, TAKATSUGU p 3045 N92-27429
ONOFRI, M. p 3101 N92-27488
OREN, R. p 3123 N92-28036
p 3123 N92-28037
OSMAN, M. A. p 3093 N92-28137
OSULLIVAN, D. p 3196 N92-27241
OSWALD, FRED B. p 3111 N92-27879

P

PACIA, ARNEL p 3050 N92-27577
PACKER, CHARLES M. p 3076 N92-27491
PADDEN, R. J. p 3171 N92-27315
PADMINI, S. p 3184 N92-27497
PAEZ, T. L. p 3107 N92-28054
PAHL, D. p 3125 N92-28206
PAILLERE, H. p 3102 N92-27675
PAILLOUS, A. p 3079 N92-27300
PALOTAS, P. A. p 3040 N92-27953
PALUMBO, DANIEL L. p 3153 N92-27589
p 3155 N92-27770
PANDOLFI, MAURIZIO p 3100 N92-27487
PANG, A. p 3088 N92-28034
PANG, D. p 3057 N92-27728
PANNETON, B. p 3035 N92-27344
PAPAILIOU, K. D. p 3098 N92-27470
PAPPAS, PAUL p 3045 N92-27719
PARIN, MICHAEL p 3050 N92-27577
PARK, NAMKYOO p 3086 N92-28085
PARMA, GEORGE F. p 3117 N92-27974
PARNELL, T. A. p 3196 N92-27223
p 3188 N92-27227
p 3164 N92-27228
p 3165 N92-27233
p 3165 N92-27235
PASCHEN, K. W. p 3192 N92-27245
PATTEN, K. O. p 3124 N92-27417
PAUL, GREG p 3069 N92-27849
PAUL, J. p 3046 N92-28118
PAULO, EUGENE P. p 3083 N92-27600
PAVEL, T. J. p 3146 N92-27414
PAVLAKOS, DINO p 3154 N92-27748
PAYNE, DAVID N. p 3086 N92-28089
PEABODY, CHARLES B. p 3181 N92-27665
PECORA, M. p 3038 N92-27942
PEETERS, M. F. p 3099 N92-27477
PEIRO, J. p 3103 N92-27676
PELRINE, RONALD E. p 3064 N92-27808
PENDER, CHARLES W. p 3170 N92-27295
PEPPER, GARY T. p 3090 N92-27662
PERAIRE, J. p 3103 N92-27676
PEREIRA, J. C. F. p 3098 N92-27476
PERKINS, LOUISE p 3134 N92-27604
PERRY, A. T. p 3066 N92-27325
PERUSEK, GAIL P. p 3049 N92-27669
PETERS, DAVID J. p 3187 N92-28188
PETERS, P. N. p 3066 N92-27219
PETERS, PALMER N. p 3078 N92-27278
p 3165 N92-27301
p 3166 N92-27302
PETERSON, DONNA J. p 3110 N92-27439
PETIT, PIERRE A. p 3127 N92-27922
PETROCCHI, PIO J. p 3082 N92-27506
PHAN, MINH p 3156 N92-27782
PHILATOV, ANATOLY P. p 3052 N92-27792
PHOEBUS, P. A. p 3134 N92-27575
PIASTUCH, W. C. p 3136 N92-27877
PIERCE, L. E. p 3088 N92-28032
PIM, RICK p 3191 N92-27689
PINCKNEY, FRANK p 3057 N92-27726
PINELLI, THOMAS E. p 3185 N92-28112
p 3185 N92-28113
p 3185 N92-28114
p 3186 N92-28115
p 3186 N92-28116
p 3186 N92-28117
p 3186 N92-28155
p 3186 N92-28183
p 3187 N92-28184
p 3187 N92-28211
p 3187 N92-28220
PIPPIN, H. GARY p 3078 N92-27272
p 3073 N92-27297
p 3111 N92-27299
PIT, FABIENNE p 3101 N92-27490
PITT, DALE M. p 3040 N92-27951
PLANT, DAVID P. p 3062 N92-27798
PLEMONS, THEODORE p 3138 N92-28135
PLYASHESHNIKOV, A. V. p 3195 N92-27493
POENSGEN, C. p 3094 N92-27407
POEPPEL, R. B. p 3176 N92-27409
POEPPEL, ROGER B. p 3058 N92-27734
POESIO, MASSIMO p 3148 N92-27591
POGGIOLINI, P. p 3167 N92-27595
p 3167 N92-27596
POINSOT, T. p 3073 N92-27486
POLEZHAYEV, P. N. p 3053 N92-27932
POLUEKTOV, V. P. p 3053 N92-27932
POMERY, P. J. p 3079 N92-27287
POSEY, P. G. p 3134 N92-27574
POTAPOV, YU. V. p 3195 N92-27494
POWELL, J. HOWARD p 3070 N92-27291
POWER, S. B. p 3128 N92-27425
POWER, SCOTT B. p 3132 N92-27356
PRAGER, MARTIN p 3075 N92-28139
PRATER, J. T. p 3071 N92-27514
PRELLER, R. H. p 3134 N92-27574
PREVIC, FRED H. p 3141 N92-27910
PREVOT, T. p 3032 N92-27895
PRIMAS, LORI p 3170 N92-28181
PRINOS, P. p 3099 N92-27481
PROTZEL, PETER W. p 3155 N92-27770
PRUNEDA, C. O. p 3080 N92-27418
PRZEKWAS, A. J. p 3105 N92-27918
PRZYSTUPA, MAREK A. p 3074 N92-27821
PUTERBAUGH, STEVEN L. p 3096 N92-27459

Q

QIAN, ZHONGSHAN p 3195 N92-27635
QUACH, CUONG p 3156 N92-27777
QUEEN, MICHAEL A. p 3057 N92-27727
p 3060 N92-27742
QUEGAN, S. p 3088 N92-28029
QUINN, J. M. p 3127 N92-27594

R

RABINOVICH, WILLIAM S. p 3108 N92-27617
RACHNER, M. p 3100 N92-27483
RADHAKRISHNAN, G. p 3178 N92-27318
RADICATIDIBROZOLO, FILIPPO p 3193 N92-27260
p 3073 N92-27262
RAGHUNATHAN, S. p 3042 N92-27961
RAIKAR, GENESH N. p 3166 N92-27302
RAISOR, RALPH C. p 3093 N92-28167
RAJAN, C. S. p 3161 N92-27556
RAJAN, P. K. p 3169 N92-27873
RAMACHANDRAN, V. S. p 3141 N92-28050
RAMALINGAM, T. p 3115 N92-28171
RANGARAO, KALURI V. p 3091 N92-27785
RANSON, K. JON p 3119 N92-28014
RAO, A. S. p 3077 N92-27966
p 3177 N92-28012
RAO, A. SRINIVASA p 3078 N92-28126
RAO, DANTAM K. p 3061 N92-27790
RAPOPORT, I. D. p 3195 N92-27495
RASOUL, F. p 3079 N92-27287
RATHODE, N. C. p 3184 N92-27497
RAUPP, F. p 3033 N92-27901
RAUSCH, RUSS D. p 3038 N92-27938
RAWLS, G. B. p 3117 N92-28041
RAY, TERRILL W. p 3088 N92-28025
REALMUTO, V. p 3123 N92-28036
REASON, CHRISTOPHER JAMES CHARLES p 3129 N92-27622
REE, M. p 3075 N92-27364
REED, LARRY p 3119 N92-27881
REEDY, ROBERT C. p 3164 N92-27225
REEDY, RONALD E. p 3089 N92-27445
REEVES, JAMES H. p 3196 N92-27224
REGINATO, RICHARD L. p 3067 N92-27627
REIF, JOHN H. p 3150 N92-27995
REINHARD, ROBIN D. p 3135 N92-27820
REISER, BRIAN J. p 3141 N92-27969
RENSING, P. E. p 3146 N92-27414
RESHOTKO, E. p 3035 N92-27377
REYNAUD, THIERRY p 3132 N92-27357
RHODES, MARVIN D. p 3156 N92-27774
RHYS-JONES, T. N. p 3048 N92-27422
RICE, M. p 3125 N92-28056
RICHELLE, MARC N. p 3141 N92-27971
RICK, W. p 3099 N92-27479
RICKS, D. R. p 3192 N92-27255
RIES, DOUGLAS M. p 3062 N92-27798
RILEY, JOHN p 3055 N92-27555
RILEY, JOHN F. p 3082 N92-27339
RISTORI, A. p 3098 N92-27475
RIVERA, JOSE A., JR. p 3041 N92-27960
RIVIERRE, C. p 3031 N92-27891
ROACH, ROBERT L. p 3102 N92-27653
ROBERT, J. P. p 3036 N92-27708
ROBERTS, BARBARA H. p 3185 N92-27997
ROBICHAUD, M. P. p 3099 N92-27477
ROBINS, L. H. p 3167 N92-27599
ROBINSON, ALLEN C. p 3154 N92-27748
ROBINSON, ANDREW L. p 3091 N92-27847
ROBINSON, PAUL AARON p 3051 N92-27645
ROCKENFELLER, U. p 3081 N92-27715
ROCKWAY, J. W. p 3083 N92-27565
RODABAUGH, E. C. p 3117 N92-28041
RODMAN, L. C. p 3105 N92-27986
RODRIGUEZ, L. M. p 3034 N92-27903
ROE, P. L. p 3102 N92-27675
p 3103 N92-27680
ROGERS, LYNN p 3050 N92-27577
ROLAND, J. P. p 3064 N92-27809
ROLLER, NORM p 3119 N92-27881
ROLON, CLAUDIA E. p 3067 N92-27627
RONCACE, ELIZABETH A. p 3067 N92-27654
ROONEY, WILLIAM p 3079 N92-27292
ROPER, ROBERT G. p 3130 N92-27696
ROSADO, LEWIS p 3059 N92-27738
ROSE, M. FRANK p 3192 N92-27250
ROSKOS, J. E. p 3185 N92-28040
ROSMOND, THOMAS E. p 3130 N92-27842
ROSSING, T. D. p 3161 N92-27411
ROTE, D. M. p 3065 N92-27813
ROTH, MARK A. p 3146 N92-27436
ROTT, HELMUT p 3120 N92-28021
ROWE, NEIL C. p 3184 N92-27860
ROY, R. M. p 3137 N92-27702
RUBIN, STANLEY G. p 3105 N92-28175
RUDDER, R. A. p 3176 N92-27402
RUDNIK, P. J. p 3110 N92-27410
RUSZALO, R. p 3071 N92-27694
RYBIN, V. V. p 3073 N92-27346

S

SABENE, RALPH p 3150 N92-27848
SACCO, G. P. p 3052 N92-27801
SAGER, J. C. p 3136 N92-27877
SAIGAL, A. p 3123 N92-27392
SAKOWSKI, BARBARA p 3102 N92-27653
SALCUDEAN, S. p 3062 N92-27797
SALCUDEAN, S. E. p 3060 N92-27747
SALOPEK, DAVID p 3191 N92-27690
SAMANIEGO, J. M. p 3073 N92-27486
SAMPAIR, THOMAS R. p 3179 N92-27221
SAMPSON, W. T., III p 3043 N92-28052
SANCHEZ, A. D. p 3171 N92-27315
SANCHEZ, F. p 3034 N92-27903
SANDERS, JAMES C. p 3060 N92-27742
SANDERS, STEVE p 3086 N92-28085
SANZ, A. p 3039 N92-27946
SAPP, CLYDE A. p 3192 N92-27251
SARABANDI, K. p 3088 N92-28032
SARGENT, JOSEPH P., JR. p 3106 N92-27630
SARIC, WILLIAM S. p 3036 N92-27710
SASA, SHUUICHI p 3042 N92-28152
SATO, MAMORU p 3042 N92-28151

SATOU, MAMORU ..... p 3042 N92-28190
SATTA, A. ..... p 3095 N92-27454
SATTLER, M. L. ..... p 3069 N92-27856
SAVILL, A. M. ..... p 3037 N92-27714
SAWAI, TADAO ..... p 3043 N92-28192
SAXTON, J. M. ..... p 3165 N92-27284
SCHAAF, STEPHEN F. ..... p 3082 N92-27503
SCHACHTER, JONATHAN ..... p 3188 N92-27636
SCHEDLBAUER, F. ..... p 3080 N92-27927
SCHEIDLER, MIKE ..... p 3157 N92-27762
SCHEURLEN, M. ..... p 3100 N92-27485
SCHIAVONE, ANTHONY J. ..... p 3047 N92-27925
SCHIMIDT-NIELSEN, ASTRID ..... p 3139 N92-27535
SCHINDLER, M. ..... p 3090 N92-27656
SCHLEIFF, PATRICIA L. ..... p 3138 N92-28135
SCHOENEBERGER, M. ..... p 3123 N92-28036
SCHOENEBERGER, P. ..... p 3123 N92-28036
SCHONENBERG, LEE W. ..... p 3183 N92-28172
SCHOTT, TIMOTHY ..... p 3053 N92-27802
SCHUBERT, L. K. ..... p 3181 N92-27590
SCHUBERT, M. ..... p 3034 N92-27905
SCHULEIN, P. ..... p 3031 N92-27889
SCHULTZ, R. L. ..... p 3033 N92-27898
SCHULZE, B. ..... p 3040 N92-27952
SCHWAB, CHRISTOPH ..... p 3158 N92-28189
SCHWARTZ, KENNETH P. ..... p 3043 N92-27682
SCHWARTZ, SUSAN K. ..... p 3149 N92-27831
SCHWEITZER, G. ..... p 3060 N92-27743
SCHWING, FRANKLIN B. ..... p 3134 N92-27621
SCHWING, JAMES L. ..... p 3149 N92-27829
SCOTT, JOACHIM H. ..... p 3072 N92-28122
SCOTT, LEWIS J. ..... p 3173 N92-27603
SCOTT, MICHAEL A. ..... p 3155 N92-27771
SCURLOCK, R. G. ..... p 3061 N92-27789
SECHKAR, EDWARD A. ..... p 3079 N92-27281
SEE, THOMAS H. ..... p 3192 N92-27244
p 3192 N92-27251
SEEGMILLER, DAVID W. ..... p 3170 N92-27307
SEHRA, ARUN K. ..... p 3049 N92-27461
SEIDEWITZ, E. ..... p 3158 N92-28210
SEILER, F. ..... p 3080 N92-27927
SELCON, S. J. ..... p 3032 N92-27893
SENGUPTA, G. ..... p 3040 N92-27953
SENGUPTA, LOUISE C. ..... p 3070 N92-27967
SERFOSS, GARY ..... p 3140 N92-27863
SERVO, J. C. ..... p 3188 N92-28042
SEYMOUR, RICHARD JOHN ..... p 3090 N92-27639
SHAN, LIN-HUA ..... p 3193 N92-27637
SHANABROOK, BENJAMIN V. ..... p 3168 N92-27616
SHAPOVALOV, G. K. ..... p 3053 N92-27803
SHARIK, TERRY ..... p 3119 N92-28017
SHARPE, PAUL ..... p 3164 N92-28008
SHAVER, ERIC GEORGE ..... p 3179 N92-27688
SHAW, ROBERT J. ..... p 3042 N92-28102
SHECHTMAN, D. ..... p 3167 N92-27599
SHEEHAN, W. H. ..... p 3087 N92-28103
SHEEN, DANIEL R. ..... p 3119 N92-28016
SHEIKH, S. I. ..... p 3033 N92-27898
SHEN, ZUPEI ..... p 3060 N92-27744
SHEPHERD, O. ..... p 3087 N92-28103
SHEPHERD, SETH D. ..... p 3170 N92-27295
SHESTOPEROV, V. YA. ..... p 3195 N92-27495
SHI, JIANCHENG ..... p 3120 N92-28020
p 3120 N92-28021
SHILEPSKY, CAROL C. ..... p 3084 N92-27758
SHIMOMURA, TAKASHI ..... p 3042 N92-28152
SHIMP, ALAN G. ..... p 3089 N92-27396
SHIN, R. T. ..... p 3088 N92-28031
SHIPLEY, MARGARET F. ..... p 3181 N92-27572
SHUCHUN, CHEN ..... p 3175 N92-27201
SIBERT, LINDA E. ..... p 3139 N92-27535
SIEBER, A. J. ..... p 3122 N92-28028
p 3088 N92-28035
SIEGEL, R. W. ..... p 3076 N92-27412
SIEGMAN, A. E. ..... p 3107 N92-27354
SIEGWART, ROLAND ..... p 3060 N92-27743
SIERON, RUSSELL ..... p 3119 N92-27881
SIFRE, WILMAR ..... p 3144 N92-28063
SIKES, ALLISON M. ..... p 3077 N92-27618
SIKORA, JOHN ..... p 3119 N92-27881
SILBERT, MARK ..... p 3033 N92-27896
SILVA, WALTER A. ..... p 3040 N92-27955
SIMMONS, REID ..... p 3173 N92-27866
SIMON, CHARLES G. ..... p 3192 N92-27254
p 3192 N92-27255
p 3193 N92-27259
SIMON, K. ..... p 3090 N92-27656
SIMPSON, R. L. ..... p 3080 N92-27418
SINGER, S. FRED ..... p 3192 N92-27253
SINSHEIMER, F. BARRY ..... p 3073 N92-27298
SIRGNANO, W. A. ..... p 3101 N92-27546
SISLIAN, J. P. ..... p 3103 N92-27683
SISSON, PATRICIA L. ..... p 3187 N92-28188
SKARSGARD, HARVEY M. ..... p 3173 N92-27882
p 3174 N92-28193
p 3174 N92-28194
SKJELLUM, A. ..... p 3146 N92-27391
SKORODELOV, V. A. ..... p 3053 N92-27934
SKRTICH, GEORGE T. ..... p 3147 N92-27544
SLEMP, WAYNE S. ..... p 3078 N92-27276
p 3079 N92-27282
SMALL, DAVID L. ..... p 3088 N92-28033
SMITH, ALAN R. ..... p 3164 N92-27226
SMITH, D. L. ..... p 3073 N92-27346
SMITH, D. R. ..... p 3149 N92-27697
SMITH, RICHARD BRENT ..... p 3108 N92-27647
SMITH, S. ..... p 3146 N92-27391
SMITH, STEVEN M. ..... p 3091 N92-27861
SMITHRICK, JOHN J. ..... p 3067 N92-27878
SNOW, RICHARD E. ..... p 3142 N92-28179
SOANE, D. S. ..... p 3089 N92-27366
SOARES, JOAO V. ..... p 3120 N92-28020
SOHN, K. H. ..... p 3035 N92-27377
SOLOWAY, DON ..... p 3155 N92-27769
SONG, JOON ..... p 3082 N92-27386
SORTORE, C. K. ..... p 3059 N92-27739
SOTOMAYER, W. A. ..... p 3038 N92-27939
SOUNDARARAJAN, S. ..... p 3165 N92-27234
SOUTH, D. W. ..... p 3125 N92-27571
SPEAR, STEVE ..... p 3111 N92-27305
SPERRY, DAVID J. ..... p 3047 N92-28004
SPRIESTERBACH, THOMAS P. .. p 3054 N92-27534
SPROUL, W. D. ..... p 3110 N92-27410
SPRUCK, J. ..... p 3158 N92-27909
SPURGEON, WILLIAM A. ..... p 3070 N92-27967
SQUILLANTE, MICHAEL R. ..... p 3058 N92-27734
SQUIRE, LARRY R. ..... p 3140 N92-27538
SREEKUMAR, K. P. ..... p 3078 N92-28159
SRIDHAR, BANAVAR ..... p 3032 N92-27894
STADERMANN, F. ..... p 3193 N92-27259
STAHL, RANDAL S. ..... p 3144 N92-28157
STECKEL, G. L. ..... p 3070 N92-27294
STEIGERWALD, ROBERT A. ..... p 3146 N92-27522
STEIN, BLAND A. ..... p 3068 N92-27269
STELLA, PAUL M. ..... p 3124 N92-27321
STEPHENS, B. ..... p 3192 N92-27250
STEPHENS, RALPH I. ..... p 3115 N92-27213
STEPHENS, ROBERT L. ..... p 3144 N92-28095
STEVENS, JAMES G. ..... p 3159 N92-27578
STEWART, JAMES F. ..... p 3048 N92-27379
p 3048 N92-27587
STEWART, ROSEMARY E. ..... p 3180 N92-27523
STILL, C. ..... p 3146 N92-27391
STOCKER, THOMAS F. ..... p 3124 N92-27426
p 3133 N92-27549
STOLL, ROBERT D. ..... p 3135 N92-27908
STOWELL, STEVEN C. ..... p 3069 N92-27752
STRAHLE, WARREN C. ..... p 3094 N92-27352
STREIN, TIMOTHY G. ..... p 3077 N92-27867
STRGANAC, THOMAS ..... p 3079 N92-27283
STRICKLAND, JOHN W. ..... p 3188 N92-27271
STRUIJS, R. ..... p 3102 N92-27675
STUBERT, B. ..... p 3050 N92-27463
STUCKEY, W. K. ..... p 3178 N92-27318
STUDER, P. A. ..... p 3059 N92-27739
SUDANI, NORIKAZU ..... p 3042 N92-28151
p 3042 N92-28190
SUN, GUOQING ..... p 3119 N92-28014
SURI, MANIL ..... p 3158 N92-28189
SUTTER, THOMAS R. ..... p 3156 N92-27773
SUZUKI, SEIZOU ..... p 3043 N92-28192
SWAB, JEFFREY J. ..... p 3069 N92-27752
SWAN, P. ..... p 3193 N92-27259
SWANSON, MAX L. ..... p 3078 N92-28148
SWENSON, HARRY N. ..... p 3032 N92-27894
SYDOW, P. DANIEL ..... p 3156 N92-27775
SZABO, BARNA A. ..... p 3158 N92-28060
SZOSTAK, MICHAEL ..... p 3055 N92-27555

T

TAGGART, DOUGLAS MICHAEL p 3135 N92-27786
TAKAHATA, RYOICHI ..... p 3059 N92-27737
TAKEUCHI, TATSU ..... p 3179 N92-28160
TALENT, DAVID ..... p 3189 N92-27651
TANACA, H. ..... p 3173 N92-27883
TANAKA, HISASHI ..... p 3064 N92-27806
TANAKA, MASAKI ..... p 3110 N92-27432
TANNENBAUM, B. D. ..... p 3181 N92-27703
TARASICK, DAVID WALTER ..... p 3127 N92-27620
TARTT, D. M. ..... p 3035 N92-27907
TAYLOR, C. ..... p 3098 N92-27474
TAYLOR, E. W. ..... p 3171 N92-27314
p 3171 N92-27315
TAYLOR, R. M. ..... p 3032 N92-27893
TAYLOR, RICK ..... p 3084 N92-27758
TAYLOR, ROGER ..... p 3069 N92-27749
TEAS, DON C. ..... p 3044 N92-27916
TENG, CHUNG-CHU ..... p 3134 N92-27575
TENNYSON, R. C. ..... p 3070 N92-27248
p 3079 N92-27288
TERENTIEV, ALEXANDER N. ..... p 3059 N92-27735
TEZDUYAR, TAYFUN E. ..... p 3102 N92-27674
THACKRAY, RICHARD I. ..... p 3139 N92-27500
p 3043 N92-27914
THOMAS, GAIL F. ..... p 3180 N92-27528
THOMAS, JOHN E. ..... p 3168 N92-27756
THOMAS, KENNETH W. ..... p 3180 N92-27528
THOMAS, VALERIE L. ..... p 3192 N92-28185
p 3187 N92-28186
p 3187 N92-28188
THOMPSON, A. ..... p 3196 N92-27241
THOMSON, EWEN M. ..... p 3131 N92-27988
TICHTINSKY, HELENE ..... p 3101 N92-27490
TIDLER, CYNTHIA E. ..... p 3170 N92-27307
TIEDERMAN, WILLIAM G. ..... p 3104 N92-27757
TINGEY, D. T. ..... p 3125 N92-28208
TIRRE, WILLIAM C. ..... p 3052 N92-27836
TORRINGTON, KENNETH G. ..... p 3143 N92-27990
TORTI, RICHARD ..... p 3064 N92-27810
TORTI, RICHARD P. ..... p 3065 N92-27815
TOUCHSTONE, MARK ..... p 3139 N92-27500
TOWNSEND, DENNIS P. ..... p 3111 N92-27879
TRAVOR, BRUCE W. ..... p 3054 N92-27374
TRAXLER, ALFONS ..... p 3060 N92-27743
TREHU, ANNE ..... p 3131 N92-27199
TREISMAN, ANNE M. ..... p 3142 N92-28170
TRENARY, MICHAEL ..... p 3071 N92-27510
TRI, TERRY O. ..... p 3144 N92-28157
TROHA, WILLIAM A. ..... p 3095 N92-27455
TRUE, B. ..... p 3049 N92-27652
TRUEBLOOD, MARK ..... p 3189 N92-27651
TRUMP, C. L. ..... p 3121 N92-28023
TRUMPER, DAVID L. ..... p 3057 N92-27727
p 3060 N92-27742
TRYGGVASON, B. V. ..... p 3060 N92-27747
TSAI, CHIA-LIN ..... p 3150 N92-27833
TSAI, STANLEY ..... p 3091 N92-27869
TSANOV, V. V. ..... p 3179 N92-28215
TSOTSONIS, S. G. ..... p 3175 N92-28196
TUNG, CHI ..... p 3143 N92-27372
TURNER, G. ..... p 3165 N92-27284
TURNER, RODERICK DAVID ..... p 3116 N92-27633
p 3117 N92-28158
TUZZOLINO, ANTHONY J. ..... p 3107 N92-27328
TYLKA, ALLAN J. ..... p 3165 N92-27240
TZAVARAS, ATHANASIOS E. ..... p 3117 N92-28178

U

UCER, AHMET S. ..... p 3098 N92-27473
UDD, ERIC ..... p 3086 N92-28090
UENER, MUHITTIN ..... p 3090 N92-27508
UENO, SEIYA ..... p 3110 N92-27432
UEYAMA, HIROCHIKA ..... p 3059 N92-27737
UHT, JOSEPH C. ..... p 3070 N92-27293
ULABY, F. T. ..... p 3088 N92-28032
ULABY, FAWWAZ T. ..... p 3119 N92-28017
ULLMAN, JEFFREY D. ..... p 3151 N92-28075
UNDERWOOD, J. H. ..... p 3075 N92-28143

V

VAHALA, KERRY J. ..... p 3086 N92-28085
VAKULENKO, M. O. ..... p 3174 N92-28044
VALENZUELA, G. R. ..... p 3121 N92-28023
VALLIMONT, JOHN ..... p 3170 N92-27310
VANCE, JOHN M. ..... p 3049 N92-28076
VANDERVEGT, G. W. ..... p 3108 N92-27443
VANDEWALL, ALLAN G. ..... p 3102 N92-27653
VANE, G. ..... p 3123 N92-28036
p 3123 N92-28037
VANKEIRSBILCK, P. ..... p 3103 N92-27678
VANSUETENDAEL, N. ..... p 3047 N92-27973
VANZANDT, J. R. ..... p 3033 N92-27900
VANZANTE, DALE E. ..... p 3048 N92-27519
VANZYL, JAKOB J. ..... p 3119 N92-28013
p 3120 N92-28020
p 3120 N92-28022
p 3088 N92-28025
p 3088 N92-28033
VAUGHAN, COURTENAY T. ..... p 3154 N92-27748
VECERA, SHAUN P. ..... p 3139 N92-27509
VENABLES, J. D. ..... p 3178 N92-27319
VENKATRAMANI, N. ..... p 3078 N92-28159
VERBER, CARL ..... p 3092 N92-27992
VERMA, SHASHI B. ..... p 3118 N92-27543
VERONA, ROBERT W. ..... p 3144 N92-28095
VERWEY, W. B. ..... p 3138 N92-27444
VEYNANTE, D. ..... p 3073 N92-27486
VIDERMAN, ZVI ..... p 3056 N92-27613
VILLASENOR, J. ..... p 3120 N92-28018
VIRKO, I. G. ..... p 3053 N92-27933
VISCHER, D. ..... p 3060 N92-27743
VOELCKERS, U. ..... p 3034 N92-27905

VOGEL, G. N. p 3131 N92-28168
VOGEL, GERARD N. p 3169 N92-27920
VOGEL, S. p 3040 N92-27952
VOGEL, THORSTEN p 3095 N92-27456
VONBENKEN, C. J. p 3169 N92-27826
VOSS, R. p 3038 N92-27943
VRANOS, A. p 3049 N92-27652
VUCINIC, D. p 3050 N92-27464
VYHNAL, RICHARD F. p 3070 N92-27291
VYSHKOV, Y. D. p 3053 N92-27803

W

WADEL, MARY F. p 3067 N92-27654
WAGNER, J. D. p 3192 N92-27246
WAIS, E. A. p 3117 N92-28041
WALDEN, CLEON, JR. p 3178 N92-27527
WALKER, CHARLES W., JR. p 3090 N92-27567
WALKER, R. M. p 3193 N92-27259
WALLACE, D. p 3178 N92-27318
WALLACE, MARCIE A. p 3139 N92-27509
WALSH, J. E. p 3128 N92-27425
WALSTAD, LEONARD J. p 3135 N92-28010
WALTERS, DAVID H. p 3182 N92-27972
WALTHER, R. p 3101 N92-27489
WANG, JIA p 3132 N92-27342
p 3129 N92-27427
WANG, QINGDE p 3190 N92-27640
WANG, RONGRUI p 3160 N92-27658
WANG, X. K. p 3092 N92-28080
WANKE, CRAIG R. p 3047 N92-27424
WARD, MICHAEL D. p 3168 N92-27720
p 3093 N92-28121
WARNER, HAROLD D. p 3140 N92-27863
WARNER, THOMAS T. p 3128 N92-27336
WARREN, JACK L. p 3192 N92-27244
WARREN, WAYNE H., JR. p 3192 N92-28185
WATANABE, MITSUO p 3110 N92-27431
WATERS, ROBERT L., JR. p 3180 N92-27552
WATKINS, BRUCE E. p 3149 N92-27718
WATKINS, JOSEPH p 3055 N92-27555
WATKINS, WILLIAM A. p 3181 N92-27553
WATTS, ALAN J. p 3128 N92-27265
WATTS, J. W., JR. p 3164 N92-27229
p 3165 N92-27233
p 3165 N92-27235
WATTS, RUSSELL p 3091 N92-27847
WEAVER, A. p 3164 N92-28047
WEAVER, MICHAEL J. p 3164 N92-28105
p 3072 N92-28120
WEBBER, W. R. p 3196 N92-27876
WEBSTER, FERRIS p 3187 N92-28186
WEGNER, W. p 3038 N92-27943
WEILAND, C. p 3099 N92-27478
WEILAND, J. p 3172 N92-27447
p 3175 N92-28198
WEINBERG, JERRY L. p 3192 N92-27253
WEINBERGER, NORMAN M. p 3140 N92-27538
WEINER, DONALD D. p 3082 N92-27386
WEINSTEIN, LISA F. p 3141 N92-27910
WEITSMAN, Y. J. p 3077 N92-27550
p 3077 N92-27592
WELCH, DOUGLAS W. p 3070 N92-27291
WELKE, STEPHEN R. p 3185 N92-28040
WELL, K. H. p 3034 N92-27902
WELLER, JOSEPH F. p 3169 N92-27999
WELLS, DAVID E. p 3044 N92-28079
WELLS, WENDLYNN p 3044 N92-28079
WEN, T. p 3125 N92-27846
WENZEL, K. P. p 3196 N92-27241
WESTBURY, CATHERINE p 3191 N92-27699
WHEELER, K. p 3088 N92-28024
WHEELER, R. M. p 3136 N92-27877
WHINNERY, JAMES E. p 3137 N92-27371
WHITAKER, ANN F. p 3079 N92-27280
WHITE, C. W. p 3178 N92-28081
WHITE, HENRY S. p 3168 N92-27720
p 3093 N92-28121
p 3072 N92-28122
WHITE, TERRY F. p 3187 N92-28220
WHITEHEAD, BRUCE A. p 3066 N92-27403
WHITEHEAD, LORNE p 3065 N92-27814
WHITESIDE, JAMES p 3079 N92-27292
WHITNEY, T. J. p 3111 N92-27996
WHITTAKER, WILLIAM p 3173 N92-27866
WIEDLOCHER, DAVID E. p 3078 N92-27247
WIEGAND, MICHAEL J. p 3111 N92-28074
WIGHTMAN, J. P. p 3075 N92-27296
WIGLE, JAMES M. p 3101 N92-27529
WILDERSON, WALTER D. p 3129 N92-27551
WILKES, DONALD R. p 3070 N92-27274
p 3078 N92-27278
p 3171 N92-27326
WILL, RALPH p 3156 N92-27779
WILLEMS, R. F. W. M. p 3031 N92-27889
WILLETT, JOHN C. p 3085 N92-28003
WILLHELM, JOSEPH p 3055 N92-27555
WILLIAMS, JOSEPH E., II p 3046 N92-28002
WILLIAMS, R. H. p 3178 N92-28165
WILLIAMS, ROBERT L., II p 3154 N92-27763
p 3155 N92-27765
WILLIFORD, R. E. p 3089 N92-27395
WILLSON, ROBERT F. p 3194 N92-27935
WILSON, BRENDA K. p 3188 N92-27324
WILT, M. J. p 3126 N92-27347
WINDISCH, C. F., JR. p 3089 N92-27395
WINZELL, BENGT p 3038 N92-27940
WISE, ROBERT L. p 3180 N92-27552
WISIAN-NEILSON, PATTY p 3076 N92-27442
WISNESKIE, BRADLEY D. p 3110 N92-27629
WITT, L. A. p 3139 N92-27501
p 3183 N92-28083
WITTIG, S. p 3100 N92-27485
WOLF, STEPHEN p 3052 N92-27978
WOLF, STEPHEN W. D. p 3052 N92-27976
p 3052 N92-27977
WOLLAM, J. S. p 3169 N92-27826
WONG, G. K. p 3092 N92-28080
WONG, Y. S. p 3038 N92-27941
WOOD, BOBBY E. p 3170 N92-27295
WOOD, LYNNETTE p 3119 N92-27881
WOODS, W. M. p 3159 N92-27568
WORLEY, P. H. p 3154 N92-28173
WORM, JEFFREY A. p 3148 N92-27585
WORTMAN, JIM J. p 3192 N92-27253
p 3192 N92-27255
WRIGHT, D. T. p 3087 N92-28100
WRIGHT, DANIEL G. p 3133 N92-27549
WU, K. CHAUNCEY p 3156 N92-27773
WU, PAO-KUN p 3133 N92-27507
WU, SHIH-CHIN p 3156 N92-27782
WU, W. p 3176 N92-27409
WU, ZHONGXIANG p 3108 N92-27657
WUEBBLES, D. J. p 3124 N92-27417
WURTMAN, RICHARD J. p 3141 N92-28094
WYNN, W. M. p 3106 N92-27857

X

XIA, J. Y. p 3098 N92-27474
XIONG, F. p 3178 N92-28081

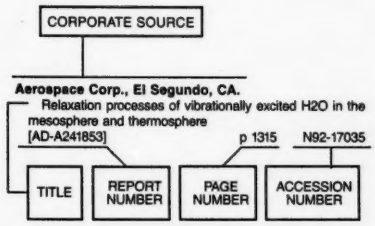
Y

YALE, GARY p 3055 N92-27555
YAMAGUCHI, ISAO p 3110 N92-27432
YANAGIHARA, MASAAKI p 3042 N92-28152
YANG, H. Q. p 3105 N92-27918
YATES, J. T., JR. p 3072 N92-28046
YAUNG, JAMES Y. p 3170 N92-27308
YEE, KAH-CHEE p 3159 N92-27384
YEH, T-J. p 3058 N92-27730
YIM, SOLOMON C. p 3134 N92-27583
YIN, HANG p 3175 N92-27201
YOON, HEE B. p 3084 N92-27783
YOSHIDA, MAKOTO p 3110 N92-27431
YOSHIDA, NORIMASA p 3043 N92-28192
YOTSUYA, TSUTOM p 3059 N92-27737
YOUCEF-TOUMI, K. p 3058 N92-27730
YOUNG, D. P. p 3040 N92-27953
YOUNG, PHILIP R. p 3078 N92-27276
p 3079 N92-27282
p 3075 N92-27296
YOUNG, POH SHIEN p 3165 N92-27238
YUEH, S. H. p 3068 N92-28031
YUNKUI, LI p 3175 N92-27201

Z

ZAKRAJSEK, JAMES J. p 3111 N92-27879
ZAMAN, K. B. M. Q. p 3035 N92-27377
ZARIFI-RAD, F. p 3042 N92-27961
ZEBKER, H. p 3123 N92-28037
ZEBKER, HOWARD A. p 3123 N92-28036
p 3088 N92-28038
ZEDAN, MOHAMED G. p 3049 N92-27461
ZHAN, YIN p 3190 N92-27687
ZHANG, GUANG JUN p 3129 N92-27610
ZHANG, JIMIN p 3074 N92-27821
ZHANG, T. G. p 3092 N92-28080
ZHANG, ZUMING p 3060 N92-27744
ZHAO, HONGBIN p 3060 N92-27744
ZHAO, XUEPU p 3194 N92-28059
ZIMMERMANN, H. p 3040 N92-27952
ZIMMERMANN, K. p 3080 N92-27927
ZIMMERMANN, R. p 3123 N92-28036
p 3123 N92-28037
ZINK, M. p 3088 N92-28030
ZINNER, E. p 3193 N92-27259
ZIOLKO, GLEN p 3069 N92-27849
ZLOTNICKI, VICTOR p 3187 N92-28186
ZMOOD, R. B. p 3057 N92-27728
ZOLENSKY, MICHAEL E. p 3192 N92-27244
p 3192 N92-27251
p 3193 N92-27256
ZOOK, HERBERT A. p 3193 N92-27263
ZUKOWSKI, EDWIN LEOPOLD HERMANN
p 3195 N92-27685
ZUMINO, B. p 3161 N92-27348
ZWIENER, JAMES M. p 3070 N92-27274
p 3078 N92-27278
ZYWICZ, E. p 3069 N92-27856

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The accession number denotes the number by which the citation is identified. The page number helps you locate the citation in the abstract section. The titles are arranged under each corporate source in ascending accession number order.

A

ACADEMY OF PEDAGOGICAL SCIENCES OF THE USSR, MOSCOW.
To the primary results of experiments in cosmic radiation particle investigation in the energy range E(greater than equals)2 TeV at the KOSMOS-1713 satellite with the SOKOL-2 equipment
[DE92-620935] p 3195 N92-27495

ACADEMY OF SCIENCES OF THE ARMENIAN SSR, ERIVAN.
Analysis of the possibilities of suppression of the cosmic-ray background when detecting very high energy cosmic gamma quanta by means of a system of Cherenkov gamma telescopes with multichannel light receivers
[DE92-620916] p 3195 N92-27493
Study of the charge and energy distributions of low-energy particles of cosmic radiation in the near-earth orbit by the method of controllable nuclear emulsion
[DE92-620924] p 3195 N92-27494

ACADEMY OF SCIENCES OF THE UKRAINIAN SSR, KIEV.
Kolmogorov spectra in a finite pressure plasma
[DE92-621531] p 3174 N92-28044

ACADEMY OF SCIENCES (USSR), MOSCOW.
Levitation of YBa2Cu3O(7-x) superconductor in a variable magnetic field p 3059 N92-27735
Cryogenic test rig with an aerodynamic magnetically levitated carriage p 3052 N92-27792

ADVANCED MECHANICAL TECHNOLOGY, INC., NEWTON, MA.
Model A: High-temperature tribometer
[AD-A249258] p 3107 N92-28217

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
CFD Techniques for Propulsion Applications
[AGARD-CP-510] p 3094 N92-27450
Special Course on Unstructured Grid Methods for Advection Dominated Flows
[AGARD-R-787] p 3102 N92-27671
Special Course on Skin Friction Drag Reduction
[AGARD-R-786] p 3036 N92-27706
Technical evaluation report on the Flight Mechanics Panel Symposium on Flying Qualities
[AGARD-AR-311] p 3046 N92-27870
Air Vehicle Mission Control and Management
[AGARD-CP-504] p 3031 N92-27887
Transonic Unsteady Aerodynamics and Aeroelasticity
[AGARD-CP-507] p 3037 N92-27936
Advances in Fibre-Optic Technology in Communications and for Guidance and Control
[AGARD-LS-184] p 3086 N92-28084

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
Visit to CALTECH and CERRA/ICASP6 reliability conference
[AD-A246432] p 3159 N92-27205
A preliminary study on damage detection using piezoelectric film
[AD-A246350] p 3046 N92-28118

AEROSPACE CORP., EL SEGUNDO, CA.
LDEF experiment M0003 meteoroid and debris survey p 3192 N92-27245
Long Duration Exposure Facility experiment M0003 deintegration observation database p 3078 N92-27273
Thermal control paints on LDEF: Results of sub-experiment 802-18 p 3078 N92-27275
Surface analyses of composites exposed to the space environment on LDEF p 3070 N92-27293
Contamination measurements on experiment M0003 p 3073 N92-27298
Post-flight analyses of the crystals from the M0003-14 quartz crystal microbalance experiment p 3178 N92-27318

AEROSPACE CORP., LOS ANGELES, CA.
Measurements of the radiation dose to LDEF by means of passive dosimetry p 3165 N92-27230
Thermal expansion behavior of LDEF metal matrix composites p 3070 N92-27294

AEROSPACE MEDICAL RESEARCH LABS., BROOKS AFB, TX.
Visual attention and perception in three-dimensional space
[AD-A247823] p 3141 N92-27910
Ergonomics manual
[AD-A246934] p 3143 N92-28071

AEROSPACE STRUCTURES INFORMATION AND ANALYSIS CENTER, WRIGHT-PATTERSON AFB, OH.
Identification of dynamic structures with special attention to damping matrix representation
[AD-A248020] p 3116 N92-27865

AEROSPATIALE, LES MUREAUX (FRANCE).
Magnetic bearing wheels for very high pointing accuracy satellite missions p 3064 N92-27809

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OH.
Spectral properties of a novel laser crystal Y3(In, Ga)2Ga3O12:Cr3(+)
[AD-A246254] p 3175 N92-27201
Using Ada bindings to the X window system
[AD-A245366] p 3146 N92-27436
A meta-analysis of pilot selection tests: Success and performance in pilot training
[AD-A246623] p 3140 N92-27537
Energy transformation properties and mechanisms in transverse flow discharged CO2 lasers
[AD-A246037] p 3108 N92-27657
Some advances in US space defense systems
[AD-A246038] p 3160 N92-27658
An analysis of fixed wing tactical airlifter characteristics using an intra-theater airlift computer model
[AD-A246908] p 3045 N92-27719
The advanced tactical fighter early, structured, and continuous user-interface process: A system program office/user team-building concept
[AD-A246641] p 3182 N92-27754
An analysis of total quality management in Aeronautical Systems Division
[AD-A246861] p 3114 N92-27760
An expert system for measuring, interpreting, and managing system performance factors for the work information management system
[AD-A246878] p 3182 N92-27824
Distributed ray casting for high-speed volume rendering
[AD-A248167] p 3150 N92-27868
Establishing a Department of Defense program management body of knowledge
[AD-A246625] p 3182 N92-27979
An exploratory application of neural networks to the sortie generation forecasting problem
[AD-A246626] p 3157 N92-27980
A study of the Air Force's exception management process: Its effect on customer service and order processing
[AD-A246627] p 3183 N92-27981
Documentation requirements for software maintenance
[AD-A246716] p 3151 N92-28069
An experimental study in the use of computer-based instruction to teach automated spreadsheet functions
[AD-A246728] p 3152 N92-28104
Relative utility of selected software requirement metrics
[AD-A246749] p 3152 N92-28106
A formal definition of the object-oriented paradigm for requirements analysis
[AD-A246814] p 3044 N92-28132

AIR FORCE SYSTEMS COMMAND, BOLLING AFB, WASHINGTON, DC.
The metrics handbook
[AD-A248591] p 3081 N92-28180

AIR WEATHER SERVICE, SCOTT AFB, IL.
Dust and sand forecasting in Iraq and adjoining countries
[AD-A247588] p 3129 N92-27551

AIRBUS INDUSTRIE, BLAGNAC (FRANCE).
Drag reduction: An industrial challenge p 3036 N92-27708

ALABAMA UNIV., HUNTSVILLE.
Cosmogenic radioisotopes on LDEF surfaces p 3165 N92-27239
Bivariate extreme value distributions
[NASA-CR-4444] p 3159 N92-27588
Glass sample preparation and performance investigations
[NASA-CR-190399] p 3189 N92-27871

ALBERTA UNIV., EDMONTON.
A time-linearization approach for unsteady transonic flows p 3038 N92-27941

ALENIA, TORINO (ITALY).
Automated target tracking and location techniques applied to optical payloads on remotely piloted vehicles p 3031 N92-27890

AMERICAN INST. OF BIOLOGICAL SCIENCES, WASHINGTON, DC.
Conference on Combined Effects: Radiation, Microgravity, Trauma, and other Factors
[AD-A247799] p 3065 N92-27862

AMERICAN SPACE TECHNOLOGY, INC., SANTA MONICA, CA.
Retrievable payload carrier. Next generation Long Duration Exposure Facility: Update 1992 p 3066 N92-27325

AMPTEK, INC., BEDFORD, MA.
Prototype instrumentation and design studies
[AD-A248378] p 3047 N92-28004

ANALYTIX CORP., HOUSTON, TX.
Innovative life cycle management systems for composites, phase 1
[AD-A246018] p 3069 N92-27827

APPLIED EXPERTISE, INC., ARLINGTON, VA.
NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397

ARGONNE NATIONAL LAB., IL.
Magneto-optical studies of ultrathin ferromagnetic films
[DE92-010252] p 3176 N92-27345
Structural materials for high-heat flux applications
[DE92-010253] p 3073 N92-27346

Combination of probabilities in looking for cosmic ray sources
[DE92-010350] p 3195 N92-27390
Finite element analysis of monolithic solid oxide fuel cells
[DE92-010515] p 3123 N92-27392
The variability residual stresses of thick superconductor films during orthorhombic to tetragonal transformation
[DE92-010499] p 3176 N92-27409
Tribological behavior of oil-lubricated, TiN-coated steel
[DE92-010500] p 3110 N92-27410
Edge effects on forces and magnetic fields produced by a conductor moving past a magnet
[DE92-010502] p 3161 N92-27411
Nanophase materials assembled from clusters
[DE92-010508] p 3076 N92-27412
Emissions trading and compliance: Regulatory incentives and barriers
[DE92-010280] p 3125 N92-27571
Computation of magnetic suspension of maglev systems using dynamic circuit theory p 3065 N92-27813
Global climate change and international security
[DE92-010868] p 3125 N92-28056

ARISTOTLE UNIV. OF THESSALONIKI (GREECE).
Three dimensional flow in sharp bends
p 3099 N92-27481

ARIZONA STATE UNIV., TEMPE.
Laminar-turbulent transition: Fundamentals
p 3036 N92-27710

ARMED FORCES INST. OF PATHOLOGY, WASHINGTON, DC.
Inspired gas composition influences recovery from experimental venous air embolism
[AD-A247004] p 3138 N92-28135

ARMY AEROMEDICAL RESEARCH LAB., FORT RUCKER, AL.
Sound attenuation characteristics of the DH-133A helmet
[AD-A248351] p 3143 N92-27991
Comparability of two cognitive performance assessment systems
[AD-A248760] p 3144 N92-28095

ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, WATERVLIET, NY.
Correlation between fracture toughness, Charpy V-notch impact energy, and yield strength for ASTM A723 steel
[AD-A249142] p 3075 N92-28143

ARMY AVIATION TECHNICAL TEST CENTER, FORT RUCKER, AL.
Methodology investigation: Aviation test management system concept implementation
[AD-A247631] p 3180 N92-27552
Steady-state acoustical noise measurements in aviation systems
[AD-A247831] p 3162 N92-27924

ARMY AVIATION TEST BOARD, FORT RUCKER, AL.
Ingress, emergency egress, and emergency evacuation testing of army aircraft
[AD-A246398] p 3043 N92-27750

ARMY COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, NH.
An analysis of the Stress Wave In Solids (SWIS) finite element code
[AD-A245921] p 3115 N92-27573

ARMY CONSTRUCTION ENGINEERING RESEARCH LAB., CHAMPAIGN, IL.
High-solids and 100-percent solids coatings: A state-of-the-art investigation
[AD-A247557] p 3076 N92-27539

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS.
Geotechnical centrifuge use at University of Cambridge Geotechnical Centre, August-September 1991
[AD-A246490] p 3126 N92-27209
Adaptive compression of multisensor image data
[AD-A248389] p 3151 N92-28006

ARMY LAB. COMMAND, FORT MONMOUTH, NJ.
Lithium rechargeable cell with a polymer cathode
[AD-A247577] p 3090 N92-27567

ARMY MATERIALS TECHNOLOGY LAB., WATERTOWN, MA.
Properties of a TZP/Al2O3 composite after long-term exposure at 1000 C
[AD-A246407] p 3069 N92-27752
Dielectric properties of polymer matrix composites prepared from conductive polymer treated fabrics
[AD-A248741] p 3070 N92-27967

ARMY MISSILE COMMAND, REDSTONE ARSENAL, AL.
Software metrics for total development cycle evaluation
[AD-A246477] p 3148 N92-27606
The relevance of the DeBroglie velocity (V1 = h/2md1) to shock loading induced reactions in lead azide
[AD-A246478] p 3177 N92-27607

AUBURN UNIV., AL.
Hypervelocity impact facility for simulating materials exposure to impact by space debris
p 3192 N92-27250

AZ TECHNOLOGY, HUNTSVILLE, AL.
Next generation optical instruments and space experiments based on the LDEF thermal control surfaces experiment (S0069) p 3171 N92-27326

B

BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
The tensor equation AX + XA = G
[AD-A246665] p 3157 N92-27762
Exponential error bounds on codes for noisy channels with inaccurately known statistics and for generalized decision rules
[AD-A246064] p 3158 N92-27834

BATH UNIV. (ENGLAND).
An evaluation of some strategies for vibration control of flexible rotors p 3063 N92-27800

BATTELLE COLUMBUS LABS., OH.
Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WA.
Oxygen permeability for selected ceramic oxides in the range 1200 to 1700 C
[AD-A247880] p 3071 N92-27514

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA).
Compression and decompression of digital seismic waveform data for storage and communication
[DE92-621016] p 3183 N92-27496
Expert System Development (ESD) shell
[DE92-621018] p 3184 N92-27497
Plasma spray technology process parameters and applications
[DE92-620035] p 3078 N92-28159

BIONETICS CORP., COCOA BEACH, FL.
A summary of porous tube plant nutrient delivery system investigations from 1985 to 1991
[NASA-TM-107546] p 3136 N92-27877

BOEING AEROSPACE CO., SEATTLE, WA.
Battery cars on superconducting magnetically levitated carriers: One commuting solution p 3065 N92-27811

BOEING CO., SEATTLE, WA.
LDEF microenvironments, observed and predicted
p 3066 N92-27220
Databases for LDEF results p 3188 N92-27270
LDEF materials data analysis: Representative examples p 3078 N92-27272
Selected results for LDEF thermal control coatings
p 3078 N92-27277
Space environmental effects on LDEF composites: Leading graphite/epoxy panel, selected trailing edge specimens p 3070 N92-27290
Contamination on LDEF sources: Distribution and history p 3073 N92-27297
Evaluation of seals, lubricants, and adhesives used on LDEF p 3111 N92-27299
Mechanisms flown on LDEF p 3111 N92-27305
UT40 STARS reuse concept. Volume 1: Conceptual framework for reuse process version 1.0
[AD-A247267] p 3150 N92-27919
Analysis of unsteady aerodynamic and flutter characteristics of an aeroelastic model in transonic flow
p 3040 N92-27953
Computed tomography analysis of castings
[AD-A249099] p 3074 N92-28053

BONN UNIV. (GERMANY, F.R.).
Examination of selected jets of extragalactic radio sources
[ETN-92-90827] p 3195 N92-27405
Implementations and analysis of foil chaff cloud measurements for the wind field in winter over northern Norway, at 75 up to 100 kilometers height
[BONN-IR-91-15] p 3128 N92-27420
The neutron-deuteron in hyperspherical formalism
[BONN-IR-91-13] p 3163 N92-27421

BOOZ-ALLEN AND HAMILTON, INC., BETHESDA, MD.
Heavy duty transport research needs assessment
[DE92-010622] p 3109 N92-27394

BRITISH AEROSPACE AIRCRAFT GROUP, KINGSTON-UPON-THAMES (ENGLAND).
Transonic aeroelastic calculations in both the time and frequency domains p 3040 N92-27950

BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
UHF television reception: Ghost images from very large buildings
[BBC-RD-1992/1] p 3087 N92-28100
On minimising noise problems caused by passenger lifts in studio centres
[BBC-RD-1992/2] p 3087 N92-28101

BRITISH COLUMBIA UNIV., VANCOUVER.
Coastally trapped disturbances in the lower atmosphere
[ISBN-0-315-55186-0] p 3129 N92-27622
Birth of universes with non-minimal coupling
[ISBN-0-315-55826-1] p 3190 N92-27623
Dynamics and control of an orbiting space platform based tethered satellite system
[ISBN-0-315-56001-0] p 3056 N92-27646
Coarse-fine residual gravity cancellation system with magnetic levitation p 3060 N92-27747
Large-gap magnetic positioning system having advantageous configuration p 3065 N92-27814

BROOKHAVEN NATIONAL LAB., UPTON, NY.
The determination of interfacial structure and phase transitions in Al/Cu and Al/Ni interfaces by means of surface extended x ray absorption fine structure
[DE92-009373] p 3074 N92-27913

BUNDESMINISTERIUM FUER FORSCHUNG UND TECHNOLOGIE, BONN (GERMANY, F.R.).
ERS-1, the European Remote Sensing satellite: A central point of the German Earth observation program
[REPT-14/91] p 3118 N92-27408

BUREAU OF RECLAMATION, DENVER, CO.
High-solids and 100-percent solids coatings: A state-of-the-art investigation
[AD-A247557] p 3076 N92-27539

C

CALIFORNIA INST. OF TECH., PASADENA.
New aspects of heavy cosmic rays from calcium to nickel (Z = 20 to 28)
[NASA-CR-190404] p 3196 N92-27876
Semiconductor lasers and fiber lasers for fiber-optic telecommunications p 3086 N92-28085

CALIFORNIA UNIV., BERKELEY.
Plasma Theory and Simulation Group
[AD-A246129] p 3171 N92-27330
Spatio-temporal masking: Hyperacuity and local adaptation
[AD-A246953] p 3138 N92-27331
Norms and the perception of events
[AD-A247032] p 3138 N92-27337
Investigation of dynamic algorithms for pattern recognition identified in cerebral cortex
[AD-A247860] p 3139 N92-27512
A study of Bowen fluorescence in accretion-powered sources p 3188 N92-27836
Visual perception of features and objects
[AD-A248578] p 3142 N92-28170

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
A photon-phreak digs the LDEF happening
p 3164 N92-27226
Interpretation of time domain electromagnetic soundings near geological contacts
[DE92-010467] p 3126 N92-27347
Introduction to the differential geometry of quantum groups
[DE92-010476] p 3161 N92-27348
The carcinogenic risks of low-LET and high-LET ionizing radiations
[DE92-010477] p 3136 N92-27349
Spectroscopy of transient neutral species via negative ion photoelectron spectroscopy
[DE92-011219] p 3164 N92-28047

CALIFORNIA UNIV., DAVIS.
Investigation of the rate-controlling mechanism(s) for high temperature creep and the relationship between creep and melting by use of high pressure as a variable
[DE92-011058] p 3074 N92-27416
Application of the A.C. Admittance technique to double layer studies on polycrystalline gold electrodes
[AD-A247108] p 3091 N92-27840

CALIFORNIA UNIV., IRVINE.
Fourth conference on the neurobiology of learning and memory
[AD-A247174] p 3140 N92-27538
Fundamental studies on droplet interactions in dense sprays
[AD-A246918] p 3101 N92-27546
Kinetics of surface reactions studied by laser desorption with FTMS detection
[AD-A248412] p 3109 N92-28051

CALIFORNIA UNIV., LOS ANGELES.
Development of the microstructure based stochastic life prediction models
[AD-A246447] p 3074 N92-27821

CALIFORNIA UNIV., SAN DIEGO.
Neural basis of motion perception
[AD-A248411] p 3141 N92-28050

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
Fabric-stress-deformation relations in granular materials
[AD-A247009] p 3117 N92-28138
CALIFORNIA UNIV., SANTA BARBARA.
Snow and glacier mapping with polarimetric SAR p 3120 N92-28021
Development and utilization of the University of California, Santa Barbara, free-electron laser
[AD-A248733] p 3109 N92-28124
Development and scientific utilization of the University of California, Santa Barbara free-electron laser
[AD-A246803] p 3109 N92-28131
CALSPAN CORP., ARNOLD AFS, TN.
Spectral infrared hemispherical reflectance measurements for LDEF tray clamps p 3170 N92-27295
CANADA CENTRE FOR REMOTE SENSING, OTTAWA (ONTARIO).
Multi-polarization C-band SAR for soil moisture estimation p 3120 N92-28019
CANADIAN SPACE AGENCY, OTTAWA (ONTARIO).
The Canadian Space Agency, Space Station, Strategic Technologies for Automation and Robotics Program technology development activity in protection of materials from the low Earth orbit space environment p 3053 N92-27327
CARDIFF UNIV. (WALES).
An XPS study of the formation of thin Pt and Ir silicide overlayers on Si (100) 2 x 1 surfaces
[AD-A245929] p 3178 N92-28165
CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
What and where in visual attention: Evidence from the neglect syndrome
[AD-A246932] p 3139 N92-27509
Fault tolerant real-time systems
[AD-A246644] p 3154 N92-27755
Autonomous planetary rover
[NASA-CR-190465] p 3173 N92-27866
The 24th Carnegie symposium on cognition: The neural basis of high-level vision
[AD-A248460] p 3142 N92-28142
CENTRE D'ETUDES ET DE RECHERCHES, TOULOUSE (FRANCE).
Basic concepts on boundary layers p 3036 N92-27707
Boundary layer transition: Prediction, application to drag reduction p 3037 N92-27711
Turbulent skin-friction drag reduction by active and passive means, part 1 p 3037 N92-27714
CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE (FRANCE).
Spacecraft thermal control coatings: Comparison between flight results obtained on LDEF and MIR .p 3079 N92-27300
New results from FRECOPA analysis p 3111 N92-27304
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, CHATENAY-MALABRY (FRANCE).
The coherent flamelet model for propulsion applications p 3073 N92-27486
CFD RESEARCH CORP., HUNTSVILLE, AL.
Pressure-based high-order TVD methodology for dynamic stall control
[AD-A247056] p 3105 N92-27918
CHALMERS UNIV. OF TECHNOLOGY, GOETEBORG (SWEDEN).
Finite element methods for flow problems p 3102 N92-27672
CHICAGO UNIV., IL.
Instrumentation for near-Earth measurement of orbital debris and cosmic dust particles p 3107 N92-27328
The structure and reactivity of boron surfaces
[AD-A247265] p 3071 N92-27510
A simple example of modeling hybrid systems using bialgebras: Preliminary version
[NASA-CR-190331] p 3157 N92-27557
First, second, and third generation high energy materials from cubane
[AD-A247559] p 3080 N92-27562
CINCINNATI UNIV., OH.
Steady and transient analysis of flows exhibiting strong viscous/inviscid interaction (Composite RNS procedures)
[AD-A247171] p 3105 N92-28175
CITY COLL. OF THE CITY UNIV. OF NEW YORK, NY.
Computational methods for stellerator configurations
[DE92-011131] p 3174 N92-28057
COASTAL ENGINEERING RESEARCH CENTER, VICKSBURG, MS.
Hindcast wave information for the great lakes: Lake Ontario
[AD-A246446] p 3135 N92-27820
COLORADO SCHOOL OF MINES, GOLDEN.
Shielded metal arc welding consumables for advanced high strength steels
[AD-A247005] p 3075 N92-28136
COLORADO UNIV., BOULDER.
Geologic mapping in Death Valley, California/Nevada using NASA/JPL airborne systems (AVIRIS, TIMS, and AIRSAR) p 3121 N92-28026
COLUMBIA UNIV., NEW YORK, NY.
Automated generation of three-dimensional virtual worlds for task explanation
[AD-A247859] p 3154 N92-27389
Autogravity waves in a polytropic layer p 3195 N92-27635
An x ray image of the Large Magellanic Cloud and a study of its hot interstellar medium p 3190 N92-27640
COMMISSION OF THE EUROPEAN COMMUNITIES, ISPRA (ITALY).
MAESTRO1 data set calibration: The JRC approach p 3122 N92-28028
Geometric rectification and geocoding of JPL's AIRSAR data over hilly terrain p 3088 N92-28035
COMPUTATIONAL MECHANICS CO., AUSTIN, TX.
A formal model of asynchronous communication and its use in mechanically verifying a biphase mark protocol
[NASA-CR-4433] p 3153 N92-27586
COMPUTER RESOURCE MANAGEMENT, INC., PLEASANTVILLE, NJ.
Avionic data bus integration technology
[DOT/FAA/CT-91/19] p 3047 N92-27973
COMPUTER SCIENCES CORP., LANHAM, MD.
Attitude Determination Error Analysis System (ADEAS) mathematical specifications document
[NASA-CR-189281] p 3158 N92-28210
Future missions studies: Combining Schatten's solar activity prediction model with a chaotic prediction model
[NASA-CR-189865] p 3194 N92-28221
COMPUTER TECHNOLOGY ASSOCIATES, INC., ROCKVILLE, MD.
Communication analysis for the expendable explorer spacecraft
[NASA-CR-189273] p 3083 N92-27516
Advanced systems engineering and network planning support
[NASA-CR-189274] p 3182 N92-27972
CONCORDIA UNIV., MONTREAL (QUEBEC).
Finite element solution of viscous compressible flows in gas turbine ducts and diffusers p 3099 N92-27477
Diminishing radiation damage and enhancing immune system recovery: A study
[DREO-CR-91-646] p 3137 N92-27702
CORNELL UNIV., ITHACA, NY.
Airborne SAR determination of relative ages of Walker Valley moraines, eastern Sierra Nevada p 3121 N92-28027
Millimeter-wave quasi-optical arrays
[AD-A248456] p 3093 N92-28141
CORVALLIS ENVIRONMENTAL RESEARCH LAB., OR.
Air pollution effects on biodiversity
[PB92-170166] p 3125 N92-28208
CRANFIELD INST. OF TECH., BEDFORD (ENGLAND).
Radial inflow turbine study
[AD-A246938] p 3049 N92-28073

D

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA).
Subinertial circulation on the Scotian Shelf observations and models
[ISBN-0-315-56167-X] p 3134 N92-27621
Application of the renormalization group to critical phenomena in magnetic systems
[ISBN-0-315-56216-1] p 3161 N92-27638
DARTMOUTH COLL., HANOVER, NH.
Implementation notes on bdes(1)
[NASA-CR-190442] p 3147 N92-27560
Applying the take-grant protection model
[NASA-CR-190439] p 3147 N92-27561
A proactive password checker
[NASA-CR-190438] p 3148 N92-27626
DAVID SARNOFF RESEARCH CENTER, PRINCETON, NJ.
High performance YBCO films
[AD-A246802] p 3093 N92-28130
DAVID TAYLOR RESEARCH CENTER, BETHESDA, MD.
The EPSA to PATRAN interface
[AD-A246489] p 3145 N92-27208
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling p 3121 N92-28023
DAWNBREAKER, ROCHESTER, NY.
Business planning for scientists and engineers
[DE92-010381] p 3188 N92-28042
DAYTON UNIV., OH.
Determination of minimum adherend thickness for climbing drum and floating roller adhesive tests
[AD-A248883] p 3111 N92-27996
DAYTON UNIV. RESEARCH INST., OH.
Area-of-Interest display resolution and stimulus characteristics effects on visual detection thresholds
[AD-A247830] p 3140 N92-27663
DEFENCE RESEARCH ESTABLISHMENT ATLANTIC, DARTMOUTH (NOVA SCOTIA).
BLADE: A propeller blade geometry generator program user's manual
[DREA-91-302] p 3149 N92-27697
DEFENCE RESEARCH ESTABLISHMENT, OTTAWA (ONTARIO).
Investigation of alpha particle induced single-event upsets in charge-coupled devices
[AD-A246268] p 3090 N92-27662
Design of digital signal processing algorithms for enhancing the measurements of ultra-fast electromagnetic transients
[AD-A246269] p 3148 N92-27663
Development of a standard anthropometric dimension set for use in computer-aided glove design
[AD-A246272] p 3143 N92-27664
Classification of SAR ship images with the aid of a syntactic pattern recognition algorithm
[DREO-TN-91-10] p 3084 N92-27695
Modelling solar radiation in the Arctic: An improved method for the subdivision of global radiation
[AD-A246271] p 3194 N92-27818
A sophisticated cad tool for the creation of complex models for electromagnetic interaction analysis
[AD-A245936] p 3085 N92-27858
Thermal resistance values of some protective clothing ensembles
[AD-A245937] p 3144 N92-28166
DEFENCE RESEARCH ESTABLISHMENT VALCARTIER (QUEBEC).
A procedure for obtaining an algebraic approximation to certain integrals
[AD-A245371] p 3157 N92-27437
DEFENSE ADVANCED RESEARCH PROJECTS AGENCY, ARLINGTON, VA.
FY 1992/1993 biennial RDT and E descriptive summaries: DARPA. Amended
[AD-A247452] p 3218 N92-27593
DEFENSE MAPPING AGENCY HYDROGRAPHIC AND TOPOGRAPHIC CENTER, WASHINGTON, DC.
Datums, ellipsoids, grids, and grid reference systems
[AD-A247651] p 3118 N92-27554
DEFENSE RESEARCH TECHNOLOGIES, INC., ROCKVILLE, MD.
Tactical communications network modelling and reliability analysis: An overview
[AD-A245339] p 3084 N92-27855
DEPARTEMENT D'ETUDES ET DE RECHERCHES EN TECHNOLOGIE SPATIALE, TOULOUSE (FRANCE).
LDEF: Dosimetric measurement results (AO 138-7 experiment) p 3165 N92-27231
Micrometeoroids and debris on LDEF p 3192 N92-27243
DEPARTMENT OF THE NAVY, WASHINGTON, DC.
Pivoting seat for fighter aircraft
[AD-D015244] p 3143 N92-27372
High pressure fiber optic connector plug
[AD-D015246] p 3166 N92-27373
Electrically actuated multiple store launcher
[AD-D015247] p 3054 N92-27374
DC uninterrupted power supply having instantaneous switching followed by low impedance switching
[AD-D015206] p 3089 N92-27398
Process for making semiconductor-on-insulator device interconnects
[AD-D015208] p 3089 N92-27445
High temperature silicide protective coating slurry
[AD-D015194] p 3076 N92-27491
High energy explosive yield enhancer using microencapsulation
[AD-D015195] p 3080 N92-27492
Mid-range UV communications
[AD-D015213] p 3083 N92-27615
Heterostructure device useable as a far infrared photodetector
[AD-D015217] p 3168 N92-27616
Holmium laser pumped with a neodymium laser
[AD-D015220] p 3108 N92-27617
Bislactone curing agents for epoxy resins and polymers obtained therefrom
[AD-D015221] p 3077 N92-27618
Environmentally stable metal powders
[AD-D015222] p 3074 N92-27619
Rocket nozzle snubber
[AD-D015239] p 3067 N92-27627
Firing assembly for stored energy launcher
[AD-D015240] p 3054 N92-27628

Burst diaphragm sequence valve
[AD-D015241] p 3110 N92-27629

Dynamic test apparatus for electro-rheological fluids
[AD-D015201] p 3106 N92-27823

Fiber-optic remote angular position sensor including a polarization track
[AD-D015210] p 3169 N92-27838

Optically stable, large time bandwidth acousto-optic heterodyne spectrum analyzer with fixed non-zero heterodyne output
[AD-D015223] p 3163 N92-27998

Bi-directional optical transmission system for RF electrical energy
[AD-D015224] p 3169 N92-27999

Low capacitance field emitter array and method of manufacture therefor
[AD-D015225] p 3092 N92-28000

All-optical fiber Faraday rotation current sensor with heterodyne detection technique
[AD-D015226] p 3170 N92-28001

Dual modular rocket launcher
[AD-D015228] p 3046 N92-28002

DEUTSCHE AIRBUS G.M.B.H., BREMEN (GERMANY, F.R.).

Computation of viscous phenomena in unsteady transonic flow p 3039 N92-27949

Computation of flutter boundaries in the time and frequency domain p 3040 N92-27952

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, GOETTINGEN (GERMANY, F.R.).

Comparison of Euler and full potential methods for unsteady transonic flow calculations p 3038 N92-27943

Computation of the unsteady transonic 2D cascade flow by an Euler algorithm with interactive grid generation p 3039 N92-27944

DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (GERMANY, F.R.).

On board planning of 4D-trajectories p 3033 N92-27897

Implementation and operational experience with a new arrival traffic management system at the Frankfurt ATC-Center p 3034 N92-27905

DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE (GERMANY, F.R.).

Computation of 3D-viscous flow and heat transfer for the application to film cooled gas turbine blades p 3095 N92-27456

Flow computation in combustion chambers using zonal nonstaggered grids p 3100 N92-27483

DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, OBERPFAFFENHOFEN (GERMANY, F.R.).

Results of the 1989 SAR calibration experiment at Oberpfaffenhofen p 3088 N92-28030

DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, WESSLING (GERMANY, F.R.).

Optimal guidance anticipating missile performance p 3034 N92-27902

DIGICOMP RESEARCH CORP., ITHACA, NY.

Integrated multi-domain radar demonstration
[AD-A246653] p 3084 N92-27758

DIRECTORATE OF SCIENTIFIC INFORMATION SERVICES, OTTAWA (ONTARIO).

Technology trends, threats, and opportunities (T(sup 3)O). Part 4: Proceedings of Workshop on Critical Enabling Technologies
[CTN-92-60495] p 3181 N92-27703

DORNIER LUFTFAHRT G.M.B.H., FRIEDRICHSHAFEN (GERMANY, F.R.).

Computations of unsteady flows around airfoil sections by explicit and implicit methods solving the Euler and Navier-Stokes equations p 3039 N92-27948

DRAPER (CHARLES STARK) LAB., INC., CAMBRIDGE, MA.

Robust intelligent flight control for hypersonic vehicles
[NASA-CR-185680] p 3051 N92-28209

DUBLIN INST. FOR ADVANCED STUDIES (IRELAND).

Ultra heavy cosmic ray experiment (A0178) p 3196 N92-27241

DUKE UNIV., DURHAM, NC.

Nonlinear optics in dense frequency narrow supersonic beams
[AD-A246647] p 3168 N92-27756

Implementation of parallel algorithms
[AD-A248759] p 3150 N92-27995

DURHAM UNIV. (ENGLAND).

Experimental verification of a 3D turbulent flow calculation in an axial turbine cascade p 3095 N92-27457

E

EASTMAN KODAK CO., ROCHESTER, NY.

Effects of long term space environment exposure on optical substrates and coatings (S0050-2) p 3170 N92-27310

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, ID.

Product assurance planning in an environment of increased need for accountability
[DE92-010850] p 3115 N92-28055

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND).

Control concepts for active magnetic bearings p 3060 N92-27743

The bearingless electrical machine p 3061 N92-27793

ELECTRICITE DE FRANCE, CHATOU.

Calculation by the finite element method of 3-D turbulent flow in a centrifugal pump p 3097 N92-27465

ELECTRONIC SYSTEM G.M.B.H., MUNICH (GERMANY, F.R.).

An efficient method for three-dimensional route planning with different strategies and constraints p 3033 N92-27901

ELORET CORP., SUNNYVALE, CA.

An experimental investigation of the separating/reattaching flow over a backstep
[NASA-CR-190426] p 3035 N92-27399

EMORY UNIV., ATLANTA, GA.

Spectroscopy and reactions of hydrazoic acid on silicon single crystal surfaces. (2). HN3 and DN3 on Si (100)
[AD-A247047] p 3177 N92-28077

ENGINEERING RESEARCH AND CONSULTING, INC., TULLAHOMA, TN.

Automated screening of propulsion system test data by neural networks, phase 1
[NASA-CR-184329] p 3066 N92-27403

ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, NC.

Clean air act requirements for trace metals information
[PB92-164995] p 3125 N92-28206

ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR.

Remote sensing for material identification under space umbrella
[AD-A247000] p 3119 N92-27881

The relationship between aboveground biomass and radar backscatter as observed on airborne SAR imagery p 3119 N92-28015

Analysis of polarimetric SAR signatures of vegetated areas p 3119 N92-28016

AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling p 3121 N92-28023

ERIL RESEARCH, INC., SAN RAFAEL, CA.

Absorbed dose measurements and predictions on LDEF p 3165 N92-27232

Light-heavy ion measurements in CR-39 located on the Earth side of LDEF p 3165 N92-27234

ESCUELA TECNICA SUPERIOR DE INGENIEROS AERONAUTICOS, MADRID (SPAIN).

Unsteady transonic aerodynamics of pointed bodies of revolution in supersonic freestream p 3039 N92-27946

EUROPEAN SPACE AGENCY. EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTER, ESTEC, NOORDWIJK (NETHERLANDS).

Predicted and observed directional dependence of meteoroid/debris impacts on LDEF thermal blankets p 3193 N92-27261

EXETER UNIV. (ENGLAND).

Instability and transition in compressible boundary layers
[AD-A248596] p 3105 N92-28062

F

FAIRFAX MATERIALS RESEARCH, INC., ALEXANDRIA, VA.

The mechanical properties of metal-void composites
[AD-A246087] p 3069 N92-27749

FARE, INC., COLLEGE PARK, MD.

Development of a differentially balanced magnetic bearing and control system for use with a flywheel energy storage system p 3062 N92-27798

FEDERAL AVIATION ADMINISTRATION, WASHINGTON, DC.

Effects of color vision deficiency on detection of color-highlighted targets in a simulated air traffic control display
[AD-A246586] p 3139 N92-27500

Gender, equity, and job satisfaction
[AD-A246588] p 3139 N92-27501

Human factors evaluation of the work environment of operators engaged in the inspection and repair of aging aircraft
[AD-A246445] p 3043 N92-27914

Effects of subordinate feedback to the supervisor and participation in decision-making in the prediction of organizational support
[AD-A249125] p 3183 N92-28083

FIBER MATERIALS, INC., BIDDEFORD, ME.

Demonstration of manufacturing process for large area, multilayer piezoelectric composites
[AD-A246662] p 3069 N92-27761

FLORIDA AGRICULTURAL AND MECHANICAL UNIV., TALLAHASSEE.

Electron interactions with non-linear polyatomic molecules and their radicals and ions
[AD-A246492] p 3163 N92-27210

FLORIDA UNIV., GAINESVILLE.

Location and characterization of in-cloud lightning currents by multiple station VHF and electric field measurements
[AD-A247051] p 3131 N92-27988

FONDAZIONE UGO BORDONI, ROME (ITALY).

Coherent communications p 3086 N92-28086

FORSCHUNGSZENTRUM JUELICH G.M.B.H. (GERMANY, F.R.).

Wide gap, permanent magnet biased magnetic bearing system p 3062 N92-27794

FOSTER-MILLER ASSOCIATES, INC., WALTHAM, MA.

Attractive and repulsive magnetic suspension systems overview p 3064 N92-27805

G

GENERAL ACCOUNTING OFFICE, WASHINGTON, DC.

Space Station: Contract oversight and performance provisions for major work packages. Briefing report to the Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space and Technology, House of Representatives
[GAO/NSIAD-92-171BR] p 3182 N92-27928

GENERAL DYNAMICS CORP., FORT WORTH, TX.

Core avionics and standardization
[AD-A248326] p 3047 N92-27925

Transonic wind tunnel investigation of limit cycle oscillations on fighter type wings p 3041 N92-27959

Advanced tactical aircraft early risk reduction phase 1 broad band IR window study
[AD-A246633] p 3046 N92-27982

GENERAL ELECTRIC CO., CINCINNATI, OH.

Engine structures modeling software system: Computer code. User's manual
[NASA-CR-189154] p 3116 N92-27872

GENOA UNIV. (ITALY).

Time-marching methods for secondary flow analysis in curved ducts p 3095 N92-27454

GEORGE WASHINGTON UNIV., WASHINGTON, DC.

Finite element methods in CFD: Grid generation, adaptivity, and parallelization p 3103 N92-27679

GEORGIA INST. OF TECH., ATLANTA.

Holographic data storage crystals for the LDEF p 3178 N92-27313

Fractal image compression of Rayleigh, Raman, LIF and LDV data in turbulent reacting flows
[AD-A246960] p 3094 N92-27352

Silicon-on-insulator photonics
[AD-A247957] p 3091 N92-27847

Integrated optical pipelined polynomial processors
[AD-A248573] p 3092 N92-27992

GEORGIA TECH RESEARCH INST., ATLANTA.

Degradation of electro-optic components aboard LDEF p 3170 N92-27306

GRUMMAN AEROSPACE CORP., BETHPAGE, NY.

Effects of the low Earth orbit space environment on the surface chemistry of Kapton polyimide film: An XPS study p 3079 N92-27292

GRUMMAN SPACE STATION, HUNTSVILLE, AL.

Criticality of Be-7 concentration in LDEF p 3165 N92-27238

H

HARVARD UNIV., CAMBRIDGE, MA.

PET studies of components of high-level vision
[AD-A246449] p 3140 N92-27822

Assimilation modeling of coastal transition zone data and continental slope flow fields
[AD-A248692] p 3135 N92-28010

HONEYWELL, INC., BLOOMINGTON, MN.

Monolithic integration of semiconductor and superconductor components
[AD-A248952] p 3092 N92-28067

HONEYWELL, INC., MINNEAPOLIS, MN.
Trajectory optimization for hypersonic aircraft guidance p 3033 N92-27898
HOUSTON UNIV., TX.
Hybrid Superconducting Magnetic Bearing (HSMB) for high load devices p 3059 N92-27736
Application of ceramic superconductors in high speed turbines p 3061 N92-27791
HULBURT (E. O.) CENTER FOR SPACE RESEARCH, WASHINGTON, DC.
Future radiation measurements in low Earth orbit p 3166 N92-27329

I

IBM FEDERAL SYSTEMS CENTER, GAITHERSBURG, MD.
UT40 STARS reuse concept. Volume 1: Conceptual framework for reuse process version 1.0
[AD-A247267] p 3150 N92-27919
IBM RESEARCH LAB., YORKTOWN HEIGHTS, NY.
Precise positioning and compliance synthesis for automatic assembly using Lorentz levitation p 3062 N92-27797
ILLINOIS UNIV., URBANA.
Compiler-assisted static checkpoint insertion
[AD-A246496] p 3145 N92-27211
Nuclear-driven flashlamp pumping of the atomic iodine laser
[DE92-010609] p 3107 N92-27393
ILLINOIS UNIV., URBANA-CHAMPAIGN.
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434
INGERSOLL-RAND CO., PHILLIPSBURG, NJ.
Active magnetic bearings: As applied to centrifugal pumps p 3057 N92-27726
INSTITUT DES HAUTES ETUDES SCIENTIFIQUES, BURES-SUR-YVETTE (FRANCE).
Boundary value problems on S(exp n) for surfaces of constant Gauss curvature
[PB92-134410] p 3158 N92-27909
INSTITUT FRANCO-ALLEMAND DE RECHERCHES, SAINT-LOUIS (FRANCE).
Erosion in a 20-mm-gun produced by normal and LOVA propellant charges
[ISL-CO-215/89] p 3080 N92-27927
INSTITUTE FOR AEROSPACE RESEARCH, OTTAWA (ONTARIO).
Trajectories and stability of trailing vortices very near the ground
[NRC-32151] p 3035 N92-27344
INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND ENGINEERING, HAMPTON, VA.
Adaptive artificial neural network for autonomous robot control p 3155 N92-27770
INSTITUTE FOR NAVAL OCEANOGRAPHY, BAY SAINT LOUIS, MS.
Comparison of Gulf Stream forecast model initialization and verification analyses
[AD-A246218] p 3134 N92-27604
INSTITUTE FOR PERCEPTION RVO-TNO, SOESTERBERG (NETHERLANDS).
Arterio-venous anastomoses and thermoregulation
[AD-A245385] p 3137 N92-27361
Attentional demands and effects of extended practice in a one-finger key-pressing task
[AD-A245384] p 3138 N92-27444
INSTITUTE FOR SPACE SCIENCE AND TECHNOLOGY, INC., GAINESVILLE, FL.
Elemental analyses of hypervelocity micro-particle impact sites on interplanetary dust experiment sensor surfaces p 3192 N92-27255
INSTITUTE OF AVIATION MEDICINE, FARNBOROUGH (ENGLAND).
A teamwork model of pilot aiding: Psychological principles for mission management systems design p 3032 N92-27893
INSTITUTO DE FISICA TEORICA, SAO PAULO (BRAZIL).
The Cornwall-Norton model in the strong coupling regime
[DE92-621061] p 3164 N92-27498
INSTITUTO DE PESQUISAS ENERGETICAS E NUCLEARES, SAO PAULO (BRAZIL).
Shape memory effect alloys
[DE92-619932] p 3074 N92-27875
INSTITUTO NACIONAL DE TECNICA AEROESPACIAL, MADRID (SPAIN).
Fuzzy guidance system evaluation p 3034 N92-27903
INSTITUTO SUPERIOR TECNICO, LISBON (PORTUGAL).
Validation of non-orthogonal three-dimensional laminar flow predictions p 3098 N92-27476
INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS, TRIESTE (ITALY).
Geometric quantization of the momentum mapping associated with coupled harmonic oscillators
[DE92-622381] p 3179 N92-28215
The structure of MFD shock waves in a model of two fluids
[DE92-622860] p 3106 N92-28216
IOWA STATE UNIV. OF SCIENCE AND TECHNOLOGY, AMES.
Visualization of boundary-layer development on turbomachine blades with liquid crystals
[NASA-CR-190433] p 3048 N92-27519
IOWA UNIV., IOWA CITY.
Fatigue life improvement of an autofrettage thick-walled pressure vessel with an external groove
[AD-A247233] p 3115 N92-27213
Electromagnetic effects in Saturn's B ring p 3193 N92-27637

J

JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
New meteoroid model predictions for directional impacts on LDEF p 3193 N92-27267
Radiation and temperature effects on LDEF fiber optic cable samples p 3171 N92-27316
LEO effects on candidate solar cell cover materials p 3124 N92-27321
Manipulation and identification of objects by magnetic forces p 3062 N92-27796
Proceedings of the Third Airborne Synthetic Aperture Radar (AIRSAR) Workshop
[NASA-CR-190461] p 3119 N92-28013
Multi-frequency and polarimetric radar backscatter signatures for discrimination between agricultural crops at the Flevoland experimental test site p 3120 N92-28018
Monsoon 1990: Preliminary SAR results p 3120 N92-28022
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling p 3121 N92-28023
Dual frequency along-track interferometry p 3088 N92-28024
Polarization signatures for abandoned agricultural fields in the Manix Basin area of the Mojave Desert p 3088 N92-28025
Information content of polarimetric SAR data p 3088 N92-28033
The AIRSAR image browse system p 3088 N92-28034
Approaches to vegetation mapping and ecophysiological hypothesis testing using combined information from TIMS, AVIRIS, and AIRSAR p 3123 N92-28036
Polarimetric radar measurements of a tropical rainforest p 3123 N92-28037
The TOPSAR interferometric radar topographic mapping instrument p 3088 N92-28038
Development of high stability analog fiber optic links
[AD-A248594] p 3170 N92-28181
JOBIN ET YVON S.A., LONGJUMEAU (FRANCE).
Ruled and holographic experiment (AO 138-5) p 3107 N92-27312
JOHNS HOPKINS UNIV., BALTIMORE, MD.
Kinetics of silicide formation in artificially multilayered chromium-amorphous silicon thin films
[AD-A246483] p 3077 N92-27837
JOHNS HOPKINS UNIV., LAUREL, MD.
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling p 3121 N92-28023
JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
JPRS report: Science and technology. Central Eurasia: Space
[JPRS-USP-92-001] p 3053 N92-27931
Gamma astronomy satellite p 3053 N92-27932
Orbital solar electric power stations p 3053 N92-27933
Project MAKS air-launched spaceplane p 3053 N92-27934

K

KARLSRUHE UNIV. (GERMANY, F.R.).
Application of Monte Carlo simulation for three-dimensional flows p 3100 N92-27485
KENT STATE UNIV., OH.
Involvement of lipid metabolism in chemical transmission processes at mossy fiber synapses
[AD-A247198] p 3141 N92-27989
KENT UNIV., CANTERBURY (ENGLAND).
LDEF's map experiment foil perforations yield hypervelocity impact penetration parameters p 3192 N92-27249
KNOLLE MAGNETRANS, SAN FRANCISCO, CA.
Knolle Magnetrans: A magnetically levitated train system p 3065 N92-27812
KOYO SEIKO CO. LTD., KOKUBUHIGANJO (JAPAN).
Characterization of superconducting magnetic bearings (dynamic stiffness and damping coefficient in axial direction) p 3059 N92-27737
KRUG LIFE SCIENCES, INC., SAN ANTONIO, TX.
Reference mode effect on the auditory display of aircraft bank angle
[AD-A247825] p 3044 N92-27916

L

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, NY.
Using seafloor arrays to measure sediment seismoacoustic and geotechnical properties
[AD-A247804] p 3135 N92-27908
LAWRENCE LIVERMORE NATIONAL LAB., CA.
Simple-reversible fiber-optic chemical sensors using solvatochromic dyes
[DE92-010441] p 3166 N92-27365
Investigation of polyisocyanates as second harmonic generating materials
[DE92-010445] p 3089 N92-27366
Using ELROS to implement ISO application protocols
[DE92-010446] p 3145 N92-27367
The multicomputer toolbox approach to concurrent BLAS and LACs
[DE92-010401] p 3146 N92-27391
Sensitivity of global warming potentials to the assumed background atmosphere
[DE92-011072] p 3124 N92-27417
Explosives simulants
[DE92-011074] p 3080 N92-27418
The microstructures of SCS-6 and SCS-8 SiC reinforcing fibers
[DE92-010449] p 3069 N92-27856
LEE (J. S.) ASSOCIATES, INC., ROCKVILLE, MD.
Tactical communications network modelling and reliability analysis: An overview
[AD-A245339] p 3084 N92-27855
LETOURNEAU COLL., LONGVIEW, TX.
Stability and reactivity of dimethylethoxysilane p 3073 N92-27286
LIEGE UNIV. (BELGIUM).
Behavioral variability, learning processes, and creativity
[AD-A248894] p 3141 N92-27971
LINCOLN UNIV., PA.
The impurity related studies of high T(sub c) superconducting materials
[AD-A248296] p 3091 N92-27869
LITTON INDUSTRIES, BLACKSBURG, VA.
Fiber optic data busses for aircraft p 3048 N92-28093
LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CA.
Investigation of ring current/storm dynamics
[AD-A247554] p 3127 N92-27594
LOGICON R AND D ASSOCIATES, LOS ANGELES, CA.
Franck-Condon factors, r-centroids electronic transition moments, and Einstein coefficients for many nitrogen and oxygen band systems
[AD-A246065] p 3071 N92-27835
LOGISTICS MANAGEMENT INST., BETHESDA, MD.
An assessment of the economic status of the antifriction bearing industry
[AD-A245373] p 3110 N92-27439
DoD implementation guidelines for Electronic Data Interchange (EDI), volume 1
[AD-A246613] p 3184 N92-27536
LOS ALAMOS NATIONAL LAB., NM.
Radioactivities induced in some LDEF samples p 3164 N92-27225
Reconstruction based on flexible prior models
[DE92-011263] p 3118 N92-28214

M

MANCHESTER COLL. OF SCIENCE AND TECHNOLOGY (ENGLAND).
Computational modelling of turbulent flow in S-bends p 3099 N92-27480
MANCHESTER UNIV. (ENGLAND).
Oxygen isotopes implanted in the LDEF spacecraft p 3165 N92-27284

MANTECH ENVIRONMENTAL TECHNOLOGY, INC., CORVALLIS, OR.
Air pollution effects on biodiversity
[PB92-170166] p 3125 N92-28208
MARTIN MARIETTA CORP., BALTIMORE, MD.
Study of factors determining the radiation sensitivity of quartz crystal oscillators (A0189) p 3178 N92-27319
MARYLAND UNIV., COLLEGE PARK.
Modelling and design for PM/EM magnetic bearings p 3057 N92-27728
MARYLAND UNIV. BALTIMORE COUNTY, CATONSVILLE.
Numerical treatment of differential and integral equations by the p and h-p versions of the finite element method
[AD-A247202] p 3158 N92-28189
MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Experimental evaluation of candidate graphical microburst alert displays
[NASA-CR-189633] p 3047 N92-27424
Rheological behavior and microstructure of ceramic particulate/aluminum alloy composites
[NASA-CR-190036] p 3074 N92-27542
Modeling of heavy-gas effects on airfoil flows
[NASA-CR-190357] p 3035 N92-27558
Experimental measurement and theoretical modeling of microwave scattering and the structure of the sea surface influencing radar observations from space
[NASA-CR-190427] p 3119 N92-27559
Dynamics and control of high precision magnetically levitated vibration isolation systems p 3058 N92-27730
Self-adaptive aeropropulsion components-enhancing axial compressor performance
[AD-A246123] p 3049 N92-27817
Vortex simulation of turbulent combustion
[AD-A247999] p 3071 N92-27853
Activities, accomplishments and research progress of the Center for Theoretical Geoplasma Physics, Center for Space Research, Massachusetts Inst. of Technology
[AD-A248572] p 3127 N92-27963
External calibration of polarimetric radars using point and distributed targets p 3088 N92-28031
Strategies to sustain and enhance performance in stressful environments
[AD-A247197] p 3141 N92-28094
MASSACHUSETTS INST. OF TECH., LEXINGTON.
Solid state research
[AD-A247338] p 3176 N92-27216
A Cramer-Rao type lower bound for essentially unbiased parameter estimation
[AD-A246666] p 3160 N92-27915
MASSACHUSETTS UNIV., AMHERST.
Cracks on or near an interface p 3116 N92-27643
Boundary value problems on S(exp n) for surfaces of constant Gauss curvature
[PB92-134410] p 3158 N92-27909
Knowledge-based natural language understanding: A AAAI-87 survey talk
[AD-A249120] p 3151 N92-28068
MCAT INST., SAN JOSE, CA.
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle
[NASA-CR-188055] p 3052 N92-27976
Development of a quiet supersonic wind tunnel with a cryogenic adaptive nozzle p 3052 N92-27977
The FML compressor as a drive system for the LFSWT: A narrative p 3052 N92-27978
MCDONNELL AIRCRAFT CO., SAINT LOUIS, MO.
ICAAS piloted simulation evaluation p 3034 N92-27906
Aeroelastic calculations for fighter aircraft using the transonic small disturbance equation p 3040 N92-27951
MCDONNELL-DOUGLAS ELECTRONIC SYSTEMS CO., SANTA ANA, CA.
Optical fiber sensors p 3086 N92-28090
MCGILL UNIV., MONTREAL (QUEBEC).
Current and future trends in Arctic climate research: Can changes of the Arctic sea ice be used as an early indicator of global warming?
[CGCR-91-1] p 3131 N92-27340
Seasonal, monthly, and annual reports of ocean weather stations: Anomaly time series of surface heat budget parameters
[CGCR-91-3] p 3131 N92-27341
Climatic atlas of seasonal sea-level pressure and sea-ice concentration in the Hudson Bay-Baffin Bay-Labrador Sea region, 1953-1988
[CGCR-91-5] p 3132 N92-27342
NSERC/AES Industrial Research Chairs in climate research, McGill University
[CRG-89-4] p 3124 N92-27343
Wave-wave interactions in a steady-state stratospheric model, part 1
[CRG-89-5-PT-1] p 3126 N92-27355
Interannual variability of sea-level pressure, sea-ice, and runoff over the Arctic
[CGCR-91-6] p 3132 N92-27356
Review of the physical oceanography of the Labrador Sea
[CGCR-90-12] p 3132 N92-27357
The oceans' role in climate variability and climate change
[CGCR-89-9] p 3124 N92-27359
Sensitivity study of a dynamic thermodynamic sea-ice model
[CGCR-91-22] p 3132 N92-27370
Climatic atlas of the Northern Hemisphere seasonal and annual mean sea-level pressures, 1952-1987
[CGCR-90-17] p 3128 N92-27425
Review of climatic fluctuations on the century timescale
[CGCR-89-7] p 3124 N92-27426
Climatic atlas of seasonal and annual Arctic sea-level pressures, SLP anomalies, and sea-ice concentrations, 1953-1988
[CGCR-91-14] p 3129 N92-27427
Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-91-17] p 3133 N92-27547
Simulation of the seasonal Arctic sea-ice cover with a dynamic thermodynamic sea-ice model
[CGCR-90-10] p 3133 N92-27548
Experiments with a coupled, zonally averaged atmosphere-ocean model: Variability of the thermohaline circulation
[CGCR-90-4] p 3133 N92-27549
Activities of the Centre for Climate and Global Change Research
[CGCR-91-10] p 3125 N92-27641
Persistent circulation anomalies in observations and in a general circulation model
[ISBN-0-315-57198-5] p 3127 N92-27642
The ocean's thermohaline circulation: Its stability, variability, and role in climate
[CGCR-91-12] p 3136 N92-28199
AES/NSERC Industrial Research Chairs (IRC) in climate research
[CGCR-91-9] p 3125 N92-28200
Wave-wave interactions in a steady-state stratospheric model, part 2
[CRG-89-6-PT-2] p 3128 N92-28201
MCMASTER UNIV., HAMILTON (ONTARIO).
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 3
[CTN-92-60539] p 3143 N92-27358
High speed interdigital MSM photodiodes
[ISBN-0-315-57980-3] p 3090 N92-27639
MECHANICAL TECHNOLOGY, INC., LATHAM, NY.
Effect of flux penetration on the load capacity of passive superconducting bearings p 3061 N92-27790
MEDICAL COLL. OF VIRGINIA, RICHMOND.
The effects of hydrazines on neuronal excitability
[AD-A247103] p 3137 N92-27844
MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH (GERMANY, F.R.).
CFD contributions during hypersonic airplane intake design p 3098 N92-27472
Aerothermodynamics of nozzle flows for advanced hypersonic propulsion systems p 3099 N92-27478
Evaluation of an unsteady implicit Euler code against two and three-dimensional standard configurations p 3039 N92-27945
MIAMI UNIV., OXFORD, OH.
Gas-phase reactions of silver cluster ions produced by fast atom bombardment
[AD-A248401] p 3164 N92-28008
Gas-phase transition metal cluster chemistry using Fourier transform mass spectrometry
[AD-A248410] p 3072 N92-28009
MICHIGAN UNIV., ANN ARBOR.
High-toughness graphite/epoxy composite material experiment p 3070 N92-27289
Project UM-HAUL (UnManned Heavy pAyload Unloader and Lander): The design of a reusable lunar lander with an independent cargo unloader
[NASA-CR-189971] p 3054 N92-27540
Project MEDSAT: The design of a remote sensing platform for malaria research and control
[NASA-CR-190008] p 3055 N92-27541
Relating the temporal change observed by AIRSAR to surface and canopy properties of mixed conifer and hardwood forests of northern Michigan p 3119 N92-28017
Calibration of a polarimetric imaging SAR p 3088 N92-28032
MIDDLE EAST TECHNICAL UNIV., ANKARA (TURKEY).
Three dimensional solution of internal flows using a cell vertex finite volume method p 3098 N92-27473
MINNESOTA UNIV., MINNEAPOLIS.
Finite element computation of unsteady incompressible flows involving moving boundaries and interfaces and iterative solution strategies p 3102 N92-27674
Quantum devices
[AD-A247795] p 3177 N92-27705
Scanning tunneling microscopy of the organic conductors (TMTSF)2X(X = C1O4-, REO4-)
[AD-A246909] p 3168 N92-27720
An investigation of the information propagation and entropy transport aspects of Stirling machine numerical simulation
[NASA-CR-189143] p 3105 N92-27975
Scanning tunneling microscopy of the organic semiconductor ((eta-C5Me5) 2Ru(1,4-(2(2))-cyclophane)) (TCNQ)4
[AD-A246848] p 3093 N92-28121
Electric field induced reconstructions in STM experiments on Au(111) surfaces
[AD-A246849] p 3072 N92-28122
MISSION RESEARCH CORP., ALBUQUERQUE, NM.
The para radiation effects current simulator
[AD-A248652] p 3106 N92-27993
MISSOURI UNIV., ROLLA.
Adiabatic shear bands in simple and dipolar viscoplastic materials
[AD-A246055] p 3077 N92-27545
MITECH, INC., WASHINGTON, DC.
Workshop on integrated Crew Resource Management (CRM)
[DOT/FAA/RD-92/5] p 3180 N92-27518
MITRE CORP., BEDFORD, MA.
JTIDS electromagnetic compatibility in the 960-1215 MHz band
[AD-A247834] p 3085 N92-27864
Technology and standards for a common air mission planner p 3033 N92-27899
Search route planning p 3033 N92-27900
Performance parameter methodology update for information delivery times
[AD-A248897] p 3185 N92-27997
MITRE CORP., MCLEAN, VA.
Small satellites and RPAs in global-change research, summary and conclusions
[AD-A247855] p 3055 N92-27388
ARM review, 1991
[AD-A247629] p 3125 N92-27511
MOSCOW INST. OF AVIATION TECHNOLOGY (USSR).
Progress of magnetic suspension systems and magnetic bearings in the USSR p 3059 N92-27740
Progress of magnetic suspension and balance systems for wind tunnels in the USSR p 3053 N92-27803
MOTOREN- UND TURBINEN-UNION MUENCHEN G.M.B.H. (GERMANY, F.R.).
Computation and visualization of specific flow phenomena in turbomachinery application p 3050 N92-27483
The 3-D Navier-Stokes flow and temperature field computation for a forced mixer nozzle p 3100 N92-27482
Numerical analysis of converging-diverging nozzle flows in chemical non-equilibrium p 3101 N92-27489

N

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL, WASHINGTON, DC.
STAR 21: Strategic technologies for the Army of the twenty-first century
[REPT-92-8945] p 3160 N92-27423
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, DC.
Research and Technology Objectives and Plans Summary (RTOPS)
[NASA-TM-101862] p 3218 N92-27360
Aerospace medicine and biology: A continuing bibliography with indexes (supplement 361)
[NASA-SP-7011(361)] p 3137 N92-27433
Issues in NASA program and project management
[NASA-SP-6101(05)] p 3181 N92-27609
Doing business with NASA
[NASA-NP-151] p 3182 N92-27843
Aeronautical engineering: A continuing bibliography with indexes (supplement 277)
[NASA-SP-7037(277)] p 3035 N92-27929
Information systems requirements for the microgravity science and applications program
[NASA-TM-107932] p 3081 N92-28203
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CA.
Further analysis of LDEF FRECOPA micrometeroid remnants p 3193 N92-27260

Observation of fullerenes (C60-C70) associated with LDEF crater number 31 p 3073 N92-27262
Multi-use lunar telescopes [NASA-TM-107908] p 3189 N92-27651
Aspects of unstructured grids and finite-volume solvers for the Euler and Navier-Stokes equations p 3103 N92-27677
Study of turbulence structure through numerical simulations: The perspective of drag and reduction p 3037 N92-27713
Status of automatic guidance systems for rotorcraft in low altitude flight p 3032 N92-27894
Transonic aeroelastic computations on wings using Navier-Stokes equations p 3041 N92-27957

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.

EnviroNET: An on-line environment data base for LDEF data p 3188 N92-27222
Overview of the systems special investigation p 3079 N92-27303
Long Duration Exposure Facility (LDEF) low-temperature Heat Pipe Experiment Package (HEPP) flight results p 3106 N92-27317
Progress towards SAR based ecosystem analysis p 3119 N92-28014
Soil moisture measurements from airborne SAR p 3120 N92-28020
Guidelines for the development of a Project Data Management Plan (PDMP) [NASA-TM-107935] p 3183 N92-28156
SPAN: Astronomy and astrophysics [NASA-TM-107940] p 3192 N92-28185
SPAN: Ocean science [NASA-TM-107939] p 3187 N92-28186
A communications model for an ISAS to NASA span link [NASA-TM-107936] p 3088 N92-28187
Management of the Space Physics Analysis Network (SPAN) [NASA-TM-107934] p 3187 N92-28188
User assembly and servicing system for Space Station, an evolving architecture approach [NASA-TM-107942] p 3066 N92-28213
Optical Terminal Definition for the Future Service Growth (FSG) module of the Advanced Tracking and Data Relay Satellite (ATDRSS) [NASA-CR-189270] p 3055 N92-28219

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. HUGH L. DRYDEN FLIGHT RESEARCH FACILITY, EDWARDS, CA.

Integrated flight propulsion control research results using the NASA F-15 HIDEC Flight Research Facility [NASA-TM-4394] p 3048 N92-27379
Flight-determined benefits of integrated flight-propulsion control systems [NASA-TM-4393] p 3048 N92-27587
From an automated flight-test management system to a flight-test engineer's workstation p 3035 N92-27907

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TX.

Detailed examination of LDEF's frame and the A0178 thermal blankets by the meteoroid and debris special investigations group p 3192 N92-27244
Meteoroid and debris special investigation group; status of 3-D crater analysis from binocular imagery p 3192 N92-27251
Scanning electron microscope/energy dispersive x ray analysis of impact residues on LDEF tray clamps p 3193 N92-27256
Compositional analysis of projectile residues on LDEF instrument AO187-1 p 3193 N92-27257
Interplanetary meteoroid debris in LDEF metal craters p 3193 N92-27258
Asteroidal versus cometary meteoroid impacts on the Long Duration Exposure Facility (LDEF) p 3193 N92-27263
Origin of orbital debris impacts on Long Duration Exposure Facility's (LDEF) trailing surfaces p 3193 N92-27264
Development of a truss joint for robotic assembly of space structures [NASA-TP-3214] p 3117 N92-27974
Johnson Space Center's regenerative life support systems test bed [NASA-TM-107943] p 3144 N92-28157
Metabolic energy requirements for space flight [NASA-TM-107933] p 3138 N92-28212

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.

Second LDEF Post-Retrieval Symposium abstracts [NASA-CP-10097] p 3196 N92-27218
A generalized approach to the thermal analysis of the Long Duration Exposure Facility's flight experiments p 3179 N92-27221
Long Duration Exposure Facility (LDEF) attitude measurements of the interplanetary dust experiment p 3192 N92-27253
LDEF materials overview p 3068 N92-27269
LDEF thermal control coatings post-flight analysis p 3078 N92-27276
LDEF polymeric materials: 10 months versus 5.8 years of exposure p 3079 N92-27282
Silazane to silica p 3079 N92-27285
Surface analysis of anodized aluminum clamps from NASA-LDEF satellite p 3075 N92-27296
Ground vibration tests of a high fidelity truss for verification of on orbit damage location techniques [NASA-TM-107626] p 3115 N92-27375
Experimental validation of clock synchronization algorithms [NASA-TP-3209] p 3153 N92-27589
Effect of collector configuration on test section turbulence levels in an open-jet wind tunnel [NASA-TM-4333] p 3051 N92-27670
Aircraft drag reduction p 3036 N92-27709
International Symposium on Magnetic Suspension Technology, part 1 [NASA-CP-3152-PT-1] p 3056 N92-27721
Overview of magnetic suspension research at Langley Research Center p 3056 N92-27722
Recent progress towards developing a high field, high-T(sub c) superconducting magnet for magnetic suspension and balance systems p 3058 N92-27734
Automation and Robotics for Space-Based Systems, 1991 [NASA-CP-10098] p 3154 N92-27763
Summary of compliant and multi-arm control at NASA, Langley Research Center p 3155 N92-27764
EVA robotics for Space Station Freedom: Dextrous Manipulator Development (DEMAND) p 3155 N92-27765
IVA robotics for Space Station Freedom p 3155 N92-27766
Hand controller study of force and control mode p 3155 N92-27767
Coherent laser radar vision system and taskspace identification p 3155 N92-27768
Neural networks modeling and control of dynamical systems p 3155 N92-27769
RMS active damping augmentation p 3155 N92-27771
A space crane concept for performing on-orbit assembly p 3155 N92-27772
Analysis and testing of a space crane articulating joint testbed p 3156 N92-27773
Automated assembly of large space structures p 3156 N92-27774
Development of a machine vision guidance system for automated assembly of space structures p 3156 N92-27775
End-effector microprocessor p 3145 N92-27776
Panel installation development in Automated Structures Assembly Lab p 3156 N92-27777
Executive system software design and expert system implementation p 3152 N92-27778
Future work in automated assembly of large space structures p 3156 N92-27779
On the use of torque-wheels for the control of large, flexible, space-based telerobotic arms p 3113 N92-27780
Modeling, control, and simulation of flexible link robotic systems p 3156 N92-27781
Passive dynamic controllers for non-linear mechanical systems p 3156 N92-27782
International Symposium on Magnetic Suspension Technology, part 2 [NASA-CP-3152-PT-2] p 3061 N92-27788
Propulsion simulator for magnetically suspended wind tunnel models p 3052 N92-27801
Present status of the MIT/NASA Langley 6-inch MSBS p 3053 N92-27802
The large-angle magnetic suspension test fixture p 3065 N92-27816
Situation assessment in the Paladin tactical decision generation system p 3032 N92-27892
Current status of computational methods for transonic unsteady aerodynamics and aeroelastic applications p 3037 N92-27937
Unstructured-grid methods development for unsteady aerodynamic and aeroelastic analyses p 3038 N92-27938
Investigation of the aeroelastic stability of the AFW wind-tunnel model using CAP-TSD p 3040 N92-27955
The benchmark aeroelastic models program: Description and highlights of initial results p 3041 N92-27960
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 3: The impact of a sponsor letter on mail survey response rates [NASA-TM-107923] p 3185 N92-28112
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 8: The role of the information intermediary in the diffusion of aerospace knowledge [NASA-TM-107949] p 3185 N92-28113
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 13: The information-seeking habits and practices of engineers [NASA-TM-107931] p 3185 N92-28114
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 17: The relationship between seven variables and the use of US government technical reports by US aerospace engineers and scientists [NASA-TM-107950] p 3186 N92-28115
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 15: Technical communications in the international workplace: Some implications for curriculum development [NASA-TM-107926] p 3186 N92-28116
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 22: Establishing a research agenda for Scientific and Technical Information (STI): Focus on the user [NASA-TM-107930] p 3186 N92-28117
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 20: Engineers as information processors: A survey of US aerospace engineering faculty and students [NASA-TM-107928] p 3186 N92-28155
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 14: An analysis of the technical communications practices reported by Israeli and US aerospace engineers and scientists [NASA-TM-107924] p 3186 N92-28183
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 21: Technological innovation and technical communications: Their place in aerospace engineering curricula. A survey of European, Japanese, and US Aerospace Engineers and Scientists [NASA-TM-107929] p 3187 N92-28184
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 19: Computer and information technology and aerospace knowledge diffusion [NASA-TM-107927] p 3187 N92-28211
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 16: Aerospace knowledge diffusion research [NASA-TM-107925] p 3187 N92-28220

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OH.

Characteristics of hypervelocity impact craters on LDEF experiment S1003 and implications of small particle impacts on reflective surfaces p 3192 N92-27252
Monte Carlo modeling of atomic oxygen attack of polymers with protective coatings on LDEF p 3079 N92-27281
The effect of the low Earth orbit environment on space solar cells: Results of the advanced photovoltaic experiment (S0014) p 3124 N92-27320
Turbulent heat flux measurements in a transitional boundary layer [NASA-TM-105623] p 3035 N92-27377
Ceramic composites: Enabling aerospace materials [NASA-TM-105599] p 3076 N92-27378
A mathematical constraint placed upon inter-blade row boundary conditions used in the simulation of multistage turbomachinery flows p 3095 N92-27458
A critical evaluation of a three-dimensional Navier-Stokes method as a tool to calculate transonic flows inside a low-aspect-ratio compressor p 3096 N92-27459
Viscous three-dimensional calculations of transonic fan performance p 3097 N92-27467
Development of an algebraic turbulence model for analysis of propulsion flows [NASA-TM-105701] p 3157 N92-27517
Experimental study of cross-stream mixing in a rectangular duct [NASA-TM-105694] p 3049 N92-27652
A fast, uncoupled, compressible, two-dimensional, unsteady boundary layer algorithm with separation for engine inlets [NASA-TM-105686] p 3102 N92-27653
Propulsion systems using in situ propellants for a Mars ascent vehicle [NASA-TM-105741] p 3067 N92-27654
Experimental performance of three design factors for ventral nozzles for SSTOVL aircraft [NASA-TM-105697] p 3049 N92-27669
Force analysis of magnetic bearings with power-saving controls p 3062 N92-27795

Validation test of advanced technology for IPV nickel-hydrogen flight cells: Update
[NASA-TM-105689] p 3067 N92-27878
Analysis and modification of a single-mesh gear fatigue rig for use in diagnostic studies
[NASA-TM-105416] p 3111 N92-27879
Comparative study of turbulence models in predicting hypersonic inlet flows
[NASA-TM-105720] p 3042 N92-28102

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, AL.
Attitude stability of LDEF: Refinement of results from the silver pinhole camera p 3066 N92-27219
Status of LDEF ionizing radiation measurements and analysis p 3196 N92-27223
Collection, analysis, and archival of LDEF activation data p 3188 N92-27227
Induced activation study of LDEF p 3164 N92-27228
Revised predictions of LDEF exposure to trapped protons p 3164 N92-27229
Charge, energy, and LET spectra measurements of charged particles in P0006 experiment of LDEF p 3165 N92-27233
Three-dimensional shielding effects on charged particle fluences measured in the P0006 experiment in LDEF p 3165 N92-27235
Materials And Processes Technical Information System (MAPTIS) LDEF materials database p 3188 N92-27271
Thermal Control Surfaces Experiment (TCSE) materials analysis p 3070 N92-27274
Flouorescence measurements of the thermal control coatings on LDEF experiments S0069 and A0114 p 3078 N92-27278
Atomic oxygen effects on thermal control and mirror coatings: Evaluation of experiment A0034 p 3078 N92-27279
Atomic oxygen effects on LDEF experiment A0171 p 3079 N92-27280
Angular distributions of 5eV atomic oxygen scattered from solid surfaces on the LDEF satellite p 3165 N92-27301
Interaction of atomic oxygen with thin film and bulk copper: An XPS, AES, XRD, and profilometer study p 3166 N92-27302

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. WALLOPS FLIGHT FACILITY, WALLOPS ISLAND, VA.
A self-zeroing capacitance probe for water wave measurements
[NASA-RP-1278] p 3135 N92-27930

NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).
NLR inviscid transonic unsteady loads prediction methods in aeroelasticity p 3039 N92-27947
Development of a method to predict transonic limit cycle oscillation characteristics of fighter aircraft p 3041 N92-27958

NATIONAL AEROSPACE LAB., KAKUDA (JAPAN).
Structural analysis of thermal fatigue failures on rocket combustion chambers by the finite element method
[NAL-TR-1117] p 3067 N92-27430
An experimental study of a small high speed LH2 rocket pump: A suppression method of asynchronous shaft vibrations
[NAL-TR-1118] p 3110 N92-27431

NATIONAL AEROSPACE LAB., TOKYO (JAPAN).
A pressure measurement method using Electronically Scanner Pressure sensors (ESP) installed in a gust wind tunnel
[NAL-TM-638] p 3051 N92-27428
NAL Dornier 228-200 flight research airplane: Present status and outline of the installed equipment
[NAL-TM-637] p 3045 N92-27429
Antenna pointing system mounted on a flexible space structure
[NAL-TR-1119] p 3110 N92-27432
Numerical simulation of shock-stall flutter of an airfoil using the Navier-Stokes equations p 3041 N92-27956
NACA0012 airfoil data corrected for sidewall boundary-layer effects in the NAL two-dimensional transonic wind tunnel
[NAL-TM-640T] p 3042 N92-28151
Estimation of cable-mounted model inertia characteristics for dynamic wind-tunnel test
[NAL-TM-641] p 3042 N92-28152
Evaluation of high lift devices of the quiet STOL experimental aircraft ASKA
[NAL-TR-1102] p 3046 N92-28153
Note on flight measured control effectiveness of the quiet STOL experimental aircraft ASKA
[NAL-TR-1103] p 3051 N92-28154
Force measurements on AGARD calibration model-B at transonic speeds in the NAL two-dimensional wind tunnel
[NAL-TM-639] p 3042 N92-28190
Evaluation of landing configuration by flight test of the quiet STOL experimental aircraft ASKA
[NAL-TR-1113] p 3047 N92-28191
A gust generation method for full configuration aircraft tests in a low speed wind tunnel. Part 1: Design and preliminary experiments
[NAL-TR-1115-PT-1] p 3043 N92-28192

NATIONAL COMPUTER SECURITY CENTER, FORT MEADE, MD.
Integrity in automated information systems
[AD-A245555] p 3185 N92-28040

NATIONAL INST. OF STANDARDS AND TECHNOLOGY, GAITHERSBURG, MD.
Diamond as an optical material
[AD-A247628] p 3167 N92-27599
Form error models of the NIST algorithm testing system
[PB92-172014] p 3150 N92-27923

NATIONAL MATERIALS ADVISORY BOARD, WASHINGTON, DC.
Life prediction methodologies for composite materials
[AD-A248637] p 3070 N92-28202

NATIONAL MATERIALS PROPERTY DATA NETWORK, INC., COLUMBUS, OH.
Marine structural steel toughness data bank, volume 3
[AD-A247924] p 3075 N92-28139

NATIONAL RESEARCH COUNCIL OF CANADA, BOUCHERVILLE (QUEBEC).
Industrial Materials Institute
[CTN-92-60488] p 3068 N92-27650

NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA (ONTARIO).
IMI: In partnership with industry
[CTN-92-60490] p 3068 N92-27614
Institute for Mechanical Engineering
[CTN-92-60489] p 3081 N92-27692
Calculation of turbulent reactive flows in general orthogonal coordinates
[NRC-32128] p 3104 N92-27693

NATIONAL TECHNICAL UNIV., ATHENS (GREECE).
Unsteady Euler calculations in 3D internal aerodynamics p 3098 N92-27470

NAVAL AEROSPACE MEDICAL RESEARCH LAB., PENSACOLA, FL.
The influence of subject expectation on visual accommodation in the dark
[AD-A245923] p 3142 N92-28164

NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.
The scope of acceleration-induced loss of consciousness research
[AD-A247872] p 3137 N92-27371
Characterization of powder coated thermoplastic composite
[AD-A247230] p 3068 N92-27383
Comparison of the event-step algorithm to other path planning methods to avoid dynamic 3D obstacles p 3033 N92-27896
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling p 3121 N92-28023

NAVAL COASTAL SYSTEMS CENTER, PANAMA CITY, FL.
Permeable prolate spheroid in an external field: Demagnetization and gradiometer performance
[AD-A245932] p 3106 N92-27857

NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CA.
ALE frequency selection for Navy modems: Analysis
[AD-A247569] p 3083 N92-27564
Evaluation of method of moments codes: University of Houston junction and numerical electromagnetic code
[AD-A247570] p 3083 N92-27565

NAVAL OCEANOGRAPHIC AND ATMOSPHERIC RESEARCH LAB., BAY SAINT LOUIS, MS.
Curve fitting using genetic algorithms
[AD-A247206] p 3145 N92-27382
Monthly mean sea ice data from the polar ice prediction system, the regional polar ice prediction system (Barents Sea), and the regional polar ice prediction system (Greenland Sea)
[AD-A246145] p 3134 N92-27574
Three-dimensional Ocean Thermal Structure (TOTS) software module software requirements specifications
[AD-A246146] p 3134 N92-27575
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling p 3121 N92-28023

NAVAL OCEANOGRAPHIC AND ATMOSPHERIC RESEARCH LAB., MONTEREY, CA.
The NOGAPS forecast model: A technical description
[AD-A247216] p 3130 N92-27842
Specification for a refractivity structure matching algorithm
[AD-A247439] p 3169 N92-27920
An evaluation of the Navy atmospheric boundary layer model
[AD-A247134] p 3131 N92-28168

NAVAL OCEANOGRAPHIC OFFICE, BAY SAINT LOUIS, MS.
National oceanographic fleet platform characteristics
[AD-A246452] p 3135 N92-27667

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA.
Design and testing of a caseless solid-fuel integral-rocket ramjet engine for use in small tactical missiles
[AD-A246226] p 3066 N92-27198
Development of an active damping system to aid in the attitude control of flexible spacecraft
[AD-A246248] p 3050 N92-27200
Investigation of a heat driven thermoacoustic prime mover above onset of self-oscillation
[AD-A246257] p 3162 N92-27202
Experimental investigation of energy dissipation in finite-amplitude standing waves
[AD-A246428] p 3109 N92-27203
Process-dependence of properties in high thermal conductivity aluminum nitride substrates for electronic packaging
[AD-A246429] p 3088 N92-27204
An investigation into the performance characteristics of a solid fuel SCRAMJET propulsion device
[AD-A246486] p 3048 N92-27206
Processing, microstructure and superplasticity in Al-Mg-Mn alloys
[AD-A246488] p 3073 N92-27207
Local Area Network (LAN) compatibility issues
[AD-A247249] p 3153 N92-27212
Satellite image display and processing with microcomputers: A proof-of-concept for the Navy Oceanographic Data Distribution System (NODDS)
[AD-A247247] p 3118 N92-27214
Alternatives for developing user documentation for applications software
[AD-A247248] p 3145 N92-27215
National airspace data interchange network analysis
[AD-A247345] p 3044 N92-27217
A study of the microstructural basis for the strength and toughness properties of overaged HSLA-100 steel
[AD-A246955] p 3073 N92-27332
Enhancement of image processing capabilities for different environments
[AD-A246956] p 3145 N92-27333
A wind tunnel study of the pioneer remotely piloted vehicle
[AD-A247028] p 3045 N92-27335
Local area networks with fiber optics
[AD-A247033] p 3166 N92-27338
Performance of a fast frequency-hopped noncoherent MFSK receiver with ratio-statistic combining over Rician fading channels with partial-band interference
[AD-A247034] p 3082 N92-27339
Human-powered helicopter: A program for design and construction
[AD-A246821] p 3142 N92-27350
Testing the accuracy of a three-dimensional acoustic coupled mode model
[AD-A247149] p 3162 N92-27369
Approximate confidence limit procedures for complex systems
[AD-A247253] p 3159 N92-27384
Data compression and archiving software implementation and their algorithm comparison
[AD-A247853] p 3146 N92-27387
Management of the fleet satellite communications satellite acquisition for the Naval Postgraduate School
[AD-A246969] p 3082 N92-27400
Design and implementation of a fiber optic token-ring local area network
[AD-A245364] p 3167 N92-27435
Improved classified material control through the application of a database management system
[AD-A245376] p 3180 N92-27440
An approach to integration of real-time software for an autonomous underwater vehicle
[AD-A245377] p 3154 N92-27441
An educational space seminar to increase American student interest in space careers
[AD-A246565] p 3179 N92-27499
Magnetic fields generated by internal ocean seawater motion
[AD-A246589] p 3132 N92-27502
NAVSPASUR sensor performance study
[AD-A246592] p 3082 N92-27503
NPSNET: Physically-based modeling enhancements to an object file format
[AD-A246594] p 3146 N92-27504

Application of neural network to adaptive control theory for super-augmented aircraft
[AD-A246596] p 3050 N92-27505
Cloud effects on ocean mixed layer in the northeast Pacific Ocean
[AD-A246920] p 3133 N92-27507
Frequency, amplitude, and phase tracking of nonsinusoidal signal in noise with extended Kalman filter
[AD-A246928] p 3090 N92-27508
Multiple-wavelength transmission measurements in rocket motor plumes
[AD-A245999] p 3067 N92-27521
Reusable software component retrieval via normalized algebraic specifications
[AD-A246002] p 3146 N92-27522
Design and implementation of a multimedia DBMS: Modification and deletion
[AD-A246080] p 3180 N92-27523
A reusable component retrieval system for prototyping
[AD-A246081] p 3147 N92-27524
Applications of high speed networks
[AD-A246082] p 3153 N92-27525
DFQL: A graphical dataflow query language
[AD-A246086] p 3180 N92-27526
Numerical investigations of breather solitons in nonlinear vibratory lattices
[AD-A246524] p 3178 N92-27527
Profile of an effective engineering manager
[AD-A246525] p 3180 N92-27528
Heat transfer, adiabatic effectiveness and injectant distributions downstream of single and double rows of film-cooling holes with compound angles
[AD-A246531] p 3101 N92-27529
Design of fast earth-return trajectories from a lunar base
[AD-A246553] p 3053 N92-27530
Monitoring of global acoustic transmissions: Signal processing and preliminary data analysis
[AD-A246572] p 3162 N92-27532
Acoustic tomography in the Greenland Sea
[AD-A246574] p 3133 N92-27533
Performance analysis of non-coplanar synergetic maneuvers
[AD-A246576] p 3054 N92-27534
A micro computer based procurement system: An application of reverse engineering techniques
[AD-A245956] p 3147 N92-27544
Spacecraft design project multipurpose satellite bus MPS
[NASA-CR-190009] p 3055 N92-27555
Equations for approximate lower confidence limits on process capability indices
[AD-A247591] p 3159 N92-27568
An empirical study of fault detection by static units-consistency analysis
[AD-A247592] p 3147 N92-27569
Computer software project management: An introduction
[AD-A246147] p 3147 N92-27576
An investigation of multivariate adaptive regression splines for modeling and analysis of univariate and semi-multivariate time series systems
[AD-A246155] p 3159 N92-27578
Comparison of Janus and field test aircraft detection ranges for the line-of-sight forward heavy system
[AD-A246047] p 3083 N92-27600
Highlights of total quality management in the Department of Defense: Lessons learned, quality measurements, and innovative practices
[AD-A246167] p 3114 N92-27602
On the consequences of bi-Maxwellian distributions on parallel electric fields
[AD-A246206] p 3173 N92-27603
Implementation of a configuration management system for a local area network
[AD-A246474] p 3153 N92-27605
A design, fabrication and test of a precision positioning servo drive for a multiplexed imaging system
[AD-A246507] p 3106 N92-27630
Ambient sound in the ocean induced by heavy precipitation and the subsequent predictability of rainfall rate
[AD-A246010] p 3129 N92-27655
Free electron laser short pulse simulation and two-mode sideband analysis
[AD-A246044] p 3108 N92-27659
A conceptual design for the Telecommunications Emergency Decision Support System (TEDSS)
[AD-A246045] p 3083 N92-27660
Design of a graphical user interface for a multimedia DBMS: Query Management Facility
[AD-A246397] p 3181 N92-27665
Monthly mean time series of temperature and salinity in Monterey Bay, 1951-1991
[AD-A246444] p 3135 N92-27666
Design and implementation of a multimedia DBMS: Complex query processing
[AD-A247054] p 3181 N92-27681
Data compression using artificial neural networks
[AD-A246906] p 3149 N92-27718
Emittance measurement of the naval postgraduate school linear accelerator using optical transition radiation techniques
[AD-A246399] p 3162 N92-27751
The error performance analysis over cyclic redundancy check codes
[AD-A246020] p 3084 N92-27783
The Coast Guard's VHF-FM national distress system: Analysis for recapitalization
[AD-A246040] p 3084 N92-27784
Adaptive digital notch filtering
[AD-A246043] p 3091 N92-27785
Determination of near-surface velocity fields in the CTZ using combined altimetric and inverse modelling techniques
[AD-A246066] p 3135 N92-27786
Integrated microwave and infrared precipitation analysis
[AD-A246070] p 3130 N92-27787
Effects of centrifugal instabilities on laminar/turbulent transition in curved channels with 40 to 1 aspect ratios
[AD-A246057] p 3104 N92-27828
Designing a graphical user interface for a bilateral negotiation support system
[AD-A247910] p 3150 N92-27848
Searching for shortest and safest paths along obstacle common tangents
[AD-A247929] p 3160 N92-27852
The use of electrical transmission line theory to predict the performance of spacecraft radiators
[AD-A247786] p 3091 N92-27861
A circuit model for two-path cutoff waveguide dielectric resonator filters
[AD-A247785] p 3092 N92-27884
An information systems architecture analysis for Naval Air Systems Command
[AD-A247787] p 3184 N92-27885
Video-text processing by using Motorola 68020 CPU and its environment
[AD-A245775] p 3184 N92-27911
The effect of latent heat release on the ERICA IOP-5 cyclone
[AD-A245779] p 3130 N92-27912
United States Coast Guard operational information systems: Improving functionality and cross-functionality
[AD-A246900] p 3184 N92-27917
Effects of high energy electron irradiation on a yttrium barium(2) copper(3) oxygen(7-delta) high temperature superconductor
[AD-A246895] p 3177 N92-27983
Concept-flow diagrams: Method for design of computer-aided instruction
[AD-A246896] p 3150 N92-27984
Development of telemetry for the agility flight test of a radio controlled fighter model
[AD-A248653] p 3055 N92-27994
A prototype climate information system
[AD-A245352] p 3131 N92-28039
Iterative methods for estimation of 2-D AR parameters using a data-adaptive Toeplitz approximation algorithm
[AD-A246009] p 3151 N92-28049
Enhancement of boiling heat transfer in di-electric fluids
[AD-A245962] p 3105 N92-28058
Survivability of meteor burst communication under adverse operating conditions
[AD-A248632] p 3085 N92-28065
Comparison of unconstrained and constrained calibration methods
[AD-A246941] p 3111 N92-28074
Investigation of an argon-filled thermoacoustic prime mover
[AD-A246751] p 3179 N92-28107
Acoustic sensing of ocean turbulence
[AD-A246752] p 3136 N92-28108
Studies of intermetallic growth in Cu-solder systems and wettability at solid-liquid interfaces
[AD-A246836] p 3075 N92-28119
Flight testing of a half-scale remotely piloted vehicle
[AD-A248568] p 3046 N92-28123
The electromagnetic pulse environment and its influence on tactical electronic and communications equipment
[AD-A246754] p 3087 N92-28129
Evaluation of absolute positioning using the Defense Mapping Agency's (GASP) program
[AD-A246818] p 3044 N92-28133
INMARSAT communications system: A systems approach
[AD-A246820] p 3087 N92-28134
Effects of non-normal outlier-prone error distribution on Kalman filter track
[AD-A247036] p 3162 N92-28146
An appraisal of cost-effectiveness models used in the Air Force and Navy aircraft engine component improvement programs
[AD-A245910] p 3049 N92-28162
The design and implementation of an expander for the hierarchical real-time constraints of Computer Aided Prototyping System (CAPS)
[AD-A245914] p 3152 N92-28163
Parasitic free switched capacitor composite operational amplifiers
[AD-A246258] p 3093 N92-28167
An efficient heuristic scheduler for hard real-time systems
[AD-A247322] p 3152 N92-28169
Statistical process control techniques for the telecommunications systems manager
[AD-A249122] p 3183 N92-28172

NAVAL RESEARCH LAB., WASHINGTON, DC.

Heavy Ions In Space (HIIS) experiment
p 3165 N92-27240
Corona inception voltage determination in electroacoustic transducer autotransformer
[AD-A247871] p 3090 N92-27513
Dual-task performance as a function of presentation mode and individual differences in verbal and spatial ability
[AD-A246611] p 3139 N92-27535
The plasma physics of processing discharges
[AD-A247560] p 3172 N92-27563
Transport in ultra-dense plasmas produced by a picosecond laser pulse
[AD-A247827] p 3174 N92-27921
Procedure for measuring radiation-induced attenuation in optical fibers and optical cables
[AD-A248393] p 3170 N92-28007

NAVAL SUBMARINE MEDICAL RESEARCH LAB., GROTON, CT.

Narrowband and broadband envelope cues for aural classification
[AD-A248693] p 3163 N92-28011

NAVAL SURFACE WARFARE CENTER, BETHESDA, MD.

Processing of YBa2Cu3O(x) ceramic materials: Effect of additives
[AD-A248738] p 3077 N92-27966
Effect of lead oxide and titania on the structure, morphology and superconductivity of Y-Ba-Cu-O ceramic materials
[AD-A248706] p 3177 N92-28012
Effect of the addition of Al2O3 and Ag2O on the morphology and superconductivity of YBa2Cu3O(6+x) ceramic materials
[AD-A248736] p 3078 N92-28126

NAVAL SURFACE WARFARE CENTER, SILVER SPRING, MD.

Infrared horizon detection
[AD-A246904] p 3084 N92-27717

NAVAL UNDERWATER SYSTEMS CENTER, NEW LONDON, CT.

Explicit solution of difference equation for the wavenumber response of fluid-loaded stiffened plate
[AD-A247922] p 3116 N92-27850

NAVAL WEAPONS CENTER, CHINA LAKE, CA.

Natural language processing of captions for retrieving multimedia data
[AD-A247780] p 3184 N92-27860

NEBRASKA UNIV., LINCOLN.

Analysis of soil and species composition
[NASA-CR-190065] p 3118 N92-27543

NETROLOGIC, INC., SAN DIEGO, CA.

Fractal image encoding
[AD-A248003] p 3161 N92-27854

NEVADA UNIV., LAS VEGAS.

CCN spectra measurements as an active tracer of stratocumulus mechanisms
[AD-A246499] p 3129 N92-27668

NEW BRUNSWICK UNIV., FREDERICTON.

Dredging research program: Global positioning system bibliography
[AD-A248954] p 3044 N92-28079

NEW JERSEY INST. OF TECH., NEWARK.

Solar activity cycle
[AD-A247212] p 3194 N92-27841

NIELSEN ENGINEERING AND RESEARCH, INC., MOUNTAIN VIEW, CA.

A study of compressible turbulence
[AD-A247001] p 3105 N92-27986

NORTH CAROLINA STATE UNIV., RALEIGH.

High resolution frequency to time domain transformations applied to the stepped carrier MRIS measurements
[NASA-CR-190432] p 3083 N92-27520

A study of juncture flow in the NASA Langley 0.3-meter transonic cryogenic tunnel
[NASA-CR-190430] p 3104 N92-27880
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023

NORTH CAROLINA UNIV., CHAPEL HILL.
Materials processing of diamond: Etching, doping by ion implantation and contact formation
[AD-A248447] p 3078 N92-28148

NORTH CAROLINA UNIV., CHARLOTTE.
Magnetostrictive direct drive motors
[NASA-CR-190451] p 3089 N92-27404
Precision magnetic suspension linear bearing
p 3057 N92-27727
Experimental results in nonlinear compensation of a one degree-of-freedom magnetic suspension
p 3060 N92-27742

NORTHWESTERN UNIV., EVANSTON, IL.
Large second-harmonic response of C60 thin films
[AD-A248957] p 3092 N92-28080
Mechanism for diamond nucleation and growth on single crystal copper surfaces implanted with carbon
[AD-A248958] p 3178 N92-28081

NOTRE DAME UNIV., IN.
Experimental investigation of turbulence behavior in shock wave/turbulent boundary layer interactions
[AD-A247792] p 3104 N92-27886
Theory of semiconducting superlattices and microstructures
[AD-A248681] p 3092 N92-27965
Scanning tunneling microscopy
[AD-A249262] p 3178 N92-28218

NSI TECHNOLOGY SERVICES CORP., RESEARCH TRIANGLE PARK, NC.
Methodology for the determination of criticality codes and recertification intervals for Tank Mounted Air Compressors (TMAC) and Base Mounted Air Compressors (BMAC)
[NASA-CR-189268] p 3114 N92-27649

O

OAK RIDGE NATIONAL LAB., TN.
Physics and diagnostics of laser ablation plume propagation for high-(Tc) superconductor film growth
[DE92-009386] p 3171 N92-27362
X ray scattering studies of polyimide thin films from poly(amic acid)s functionalized with a methacrylate
[DE92-010120] p 3075 N92-27364
An introduction to computer viruses
[DE92-010727] p 3147 N92-27570
Phase modeling of a parallel scientific code
[DE92-010292] p 3154 N92-28173

OBSERVATOIRE DE LA COTE D'AZUR, NICE (FRANCE).
Long-term particle flux variability indicated by comparison of Interplanetary Dust Experiment (IDE) timed impacts for LDEF's first year in orbit with impact data for the entire 5.75-year orbital lifetime p 3192 N92-27254

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).
Validation of a CANARI code by the computation of three dimensional turbulent flow in turbine valve
p 3050 N92-27462
Steady and unsteady 3D flow computation through a transonic turbine stage p 3050 N92-27469
Presentation of a computational code for 3-D compressible flow in complex channels and cavities
p 3098 N92-27475
Three dimensional calculations of reactive flows within aircraft combustion chambers including some combustion models p 3101 N92-27490
Direct coupling of fluid structure in transonic aeroelasticity p 3040 N92-27954

OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC.
Improving the impact of Federal scientific and technical information: A call for action p 3186 N92-28149

OHIO STATE UNIV., COLUMBUS.
Precomplexation and activation of carboxylate and phosphate esters
[AD-A247778] p 3077 N92-27704

OKLAHOMA STATE UNIV., STILLWATER.
Final results of the Space Exposed Experiment Developed for Students (SEEDS) P-0004-2
p 3136 N92-27322

OLD DOMINION UNIV., NORFOLK, VA.
Large-gap magnetic suspension systems
p 3057 N92-27724
Geometric modeling for computer aided design
[NASA-CR-190363] p 3149 N92-27829
System requirements specification for SMART structures mode p 3149 N92-27830
Surface generation and editing operations applied to structural support of aerospace vehicle fuselages
p 3149 N92-27831
Application driven interface generation for EASIE
p 3145 N92-27832
Generating the complete control environment interface for EASIE p 3150 N92-27833
Parallel-vector computation for structural analysis and nonlinear unconstrained optimization problems
[NASA-CR-186516] p 3116 N92-27874

OREGON STATE UNIV., CORVALLIS.
Investigations of the seafloor coupling characteristics of the new ONR OBS and related questions
[AD-A246241] p 3131 N92-27199
Chaotic and random responses of ocean structural systems
[AD-A247561] p 3134 N92-27583

OREGON UNIV., EUGENE.
Visual processing in texture segregation
[AD-A247173] p 3142 N92-28176

OTTAWA UNIV. (ONTARIO).
Autoignition of single droplets of two-component liquid fuels
[CTN-92-60454] p 3071 N92-27634
A model for the autoignition of single liquid droplets at high pressure
[CTN-92-60493] p 3071 N92-27694

P

PACIFIC NORTHWEST LAB., RICHLAND, WA.
Sensitivity of LDEF foil analyses using ultra-low background germanium versus large NaI(T1) multidimensional spectrometers p 3196 N92-27224
The application of chaos theory to an alumina sensor for aluminum reduction cells
[DE92-010630] p 3089 N92-27395

PARAMAX SYSTEMS CORP., RESTON, VA.
UT40 STARS reuse concept. Volume 1: Conceptual framework for reuse process version 1.0
[AD-A247267] p 3150 N92-27919

PARIS VI UNIV. (FRANCE).
On the computation of unsteady turbomachinery flows. Part 1: Euler equations in vibrating cascades
p 3096 N92-27460
Line intensities and self-broadening coefficients of 12 carbon 16 oxygen(2) and 13 carbon 16 oxygen(3) lines in the laser band region
[AD-A248612] p 3072 N92-28064

PARIS XI UNIV., ORSAY (FRANCE).
In orbit degradation of UV optical components for the wavelength range 10-140 microns. AO 138.3 (FRECOPA) p 3170 N92-27309

PARK SEED CO., INC., GREENWOOD, SC.
Continued results of the seeds in space experiment
p 3136 N92-27323

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Modeling and observational studies of mesoscale air-mass boundaries and warm-season convective precipitation
[AD-A247030] p 3128 N92-27336
Wave propagation at regional distances
[AD-A246890] p 3126 N92-27380
A study of the gas-phase chemistry of solid propellant ingredients using CO2 laser heating
[AD-A246510] p 3080 N92-27631
Particle image velocimetry
[AD-A246638] p 3052 N92-27753
Characterization of sub-micron sized carbon electrodes insulated with a phenol-allylphenol copolymer
[AD-A248164] p 3077 N92-27867
A study of gas phase chemistry of solid propellants using a microprobe mass spectrometer system. Results for RDX, BLX-9, XM-39, M-9 and JA-2
[AD-A245907] p 3081 N92-28161

PENNSYLVANIA UNIV., PHILADELPHIA.
Sudbury Neutrino Observatory
[DE92-011021] p 3194 N92-27415

PHILLIPS LAB., EDWARDS AFB, CA.
Advanced materials for turbomachinery. Technical memo number 2: Advanced materials compatibility with storable propellants (monomethyl hydrazine and nitrogen tetroxide)
[AD-A246725] p 3080 N92-28070

PHILLIPS LAB., HANSCOM AFB, MA.
An 11-CM full-matrix polarimetric radar for meteorological research
[AD-A246893] p 3082 N92-27506
Small balloon ballistic tracing and behavior anomalies
[AD-A247435] p 3130 N92-27845
Catalog of absolutely calibrated, range normalized, wideband, electric field waveforms from located lightning flashes in Florida. Volume 2: 8 and 10 August 1985 data
[AD-A248377] p 3085 N92-28003

PHILLIPS LAB., KIRKLAND AFB, NM.
Degradation of optical components in a space environment p 3170 N92-27307
Characterization of a space orbited incoherent fiber optic bundle p 3171 N92-27314
Analysis of space environment effects on active fiber optic links orbited aboard the LDEF
p 3171 N92-27315

PHOTONETICS S.A., MARLY-LE-ROI (FRANCE).
Fiber-optic gyroscope p 3087 N92-28092

PHYSICS AND ELECTRONICS LAB. TNO, THE HAGUE (NETHERLANDS).
Pascal software for CO2-Laserradar ranging with a HP9000 computer
[AD-A245383] p 3108 N92-27443
Airpower planning and battle management training at airbase level p 3031 N92-27889

PITTSBURGH UNIV., PA.
Vibrational spectroscopic studies of surface chemical interactions in chemisorption and catalysis
[DE92-011189] p 3072 N92-28046

POD ASSOCIATES, INC., ALBUQUERQUE, NM.
Damage areas due to impact craters on LDEF aluminum panels p 3192 N92-27246
Modelling the near-Earth space environment using LDEF data p 3128 N92-27265

POLITECNICO DI TORINO (ITALY).
Nonequilibrium 3D flows of air through inlets
p 3100 N92-27487

PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CT.
Feasibility of magnetic bearings for advanced gas turbine engines p 3059 N92-27738

PRINCETON UNIV., NJ.
Causal models in the acquisition and instruction of programming skills
[AD-A248761] p 3141 N92-27969

PURDUE UNIV., WEST LAFAYETTE, IN.
Turbulence structure and polymer drag reduction in adverse pressure gradient boundary layers
[AD-A246651] p 3104 N92-27757
Atomic-level structure and dynamics of ordered metal electrodes as probed by infrared spectroscopy and scanning tunneling microscopy
[AD-A246738] p 3164 N92-28105
Initial surface structure of flame-annealed Au(100) in aqueous solution: Consistency between in-situ scanning tunneling microscopy and electrochemical results
[AD-A246847] p 3072 N92-28120

Q

QUEENS UNIV., BELFAST (NORTHERN IRELAND).
Further investigation of the effect of model cooling on periodic transonic flow p 3042 N92-27961

QUEENS UNIV., KINGSTON (ONTARIO).
Solutions of Einstein's equations having functionally separable metrics
[ISBN-0-315-60751-3] p 3179 N92-27688
Development of voids in the thin-wall approximation
[ISBN-0-315-60772-6] p 3191 N92-27689
Turbulent cooling flows in galaxies and clusters
[ISBN-0-315-61634-2] p 3191 N92-27699
Identification and study of HII regions in the IRAS point source catalog
[ISBN-0-315-61537-0] p 3189 N92-27700
Self-similar spiral structure in astrophysical disks
[ISBN-0-315-61539-7] p 3191 N92-27701

QUEENSLAND UNIV., BRISBANE (AUSTRALIA).
An ESR study of the UV degradation of FEP
p 3079 N92-27287

R

RAILWAY TECHNICAL RESEARCH INST., TOKYO (JAPAN).
Change in the coil distribution of electrodynamic suspension system p 3064 N92-27806

RANGE COMMANDERS COUNCIL, WHITE SANDS MISSILE RANGE, NM.
Meteorological measurement guide
[AD-A247455] p 3130 N92-27859

RAYTHEON CO., LEXINGTON, MA.
Miniature microwave frequency multiplexers
[AD-A246032] p 3090 N92-27656

RDP, INC., WALTHAM, MA.
Visual photometric experiment data processing system
[AD-A248657] p 3044 N92-27964

RENSSELAER POLYTECHNIC INST., TROY, NY.
Probing cosmic infrared sources: A computer modeling approach
[AD-A247038] p 3196 N92-28147

RESEARCH AND DEVELOPMENT LABS., CULVER CITY, CA.
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 13: Wright Laboratory
[AD-A248776] p 3218 N92-28078
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 9: Wright Laboratory
[AD-A248772] p 3218 N92-28096
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) repoorts. Volume 10: Armstrong Laboratory
[AD-A248773] p 3218 N92-28097
United States Air Force Summer Research Program 1991. High School Apprenticeship Program (HSAP) reports. Volume 11: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248774] p 3219 N92-28098
United States Air Force Summer Research program 1991. High School Apprenticeship Program (HSAP) reports. Volume 12: Rome Laboratory, Arnold Engineering Development Center
[AD-A248775] p 3219 N92-28099
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 6: Armstrong Laboratory, Wilford Hall Medical Center
[AD-A248769] p 3219 N92-28109
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 7: Phillips Laboratory, Civil Engineering Laboratory
[AD-A248770] p 3219 N92-28110
United States Air Force Summer Research Program 1991. Graduate Student Research Program (GSRP) reports. Volume 8: Rome Laboratory, Arnold Engineering Development Center, F. J. Seiler Research Laboratory
[AD-A248771] p 3219 N92-28111
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5A: Wright Laboratory
[AD-A248767] p 3219 N92-28127
United States Air Force Summer Research Program 1991. Summer Faculty Research Program (SFRP) reports. Volume 5B: Wright Laboratory
[AD-A248768] p 3219 N92-28128

RESEARCH INST. FOR COMPUTING AND INFORMATION SYSTEMS, HOUSTON, TX.
NASA technology transfer network communications and information system: TUNS user survey
[NASA-CR-190385] p 3183 N92-27397
Determining rules for closing customer service centers: A public utility company's fuzzy decision
[NASA-CR-190390] p 3181 N92-27572
Measuring uncertainty by extracting fuzzy rules using rough sets and extracting fuzzy rules under uncertainty and measuring definability using rough sets
[NASA-CR-190394] p 3148 N92-27585
Research into the development of a knowledge acquisition taxonomy
[NASA-CR-189939] p 3152 N92-28150

RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, NC.
Development of a Ge/GaAs HMT technology based on plasma enhanced chemical vapor deposition
[AD-A246991] p 3176 N92-27381
Investigation of low-temperature, multilevel dielectrics for application for radiation tolerant, submicron-scaled IC technology
[AD-A246989] p 3089 N92-27401
Passivation and gating of GaAs and Si surfaces using pseudomorphic structures
[AD-A246990] p 3176 N92-27402

ROCHESTER UNIV., NY.
The TRAINS project
[AD-A247447] p 3181 N92-27590
Scope ambiguity and inference
[AD-A247448] p 3148 N92-27591
Reference frames in vision
[AD-A248743] p 3138 N92-27968
The RHET system: A sequence of self-guided tutorials
[AD-A248960] p 3151 N92-28082

ROCKEFELLER UNIV., NEW YORK, NY.
Some basic research problems related to energy
[DE92-011220] p 3072 N92-28043

ROCKWELL INTERNATIONAL CORP., TULSA, OK.
Evaluation of long-duration exposure to the natural space environment on the mechanical properties of carbon-reinforced epoxy and polyimide composites
p 3070 N92-27291

ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CA.
Research in high dielectric properties of ferroelectric materials
[AD-A246899] p 3177 N92-27985

ROCKY RESEARCH CORP., BOULDER CITY, NV.
Solid-vapor adsorption refrigeration system development
[PB92-164383] p 3081 N92-27715

ROLLS-ROYCE LTD., BRISTOL (ENGLAND).
Thermally sprayed coating systems for surface protection and clearance control applications in aero engines
[PNR-90802] p 3048 N92-27422
Modelling the vaporiser and primary zone flows for a modern gas turbine combustion chamber
p 3050 N92-27484

ROLLS-ROYCE LTD., DERBY (ENGLAND).
The application of a Navier-Stokes CFD method to civil engine intake flows p 3098 N92-27471

ROME LAB., GRIFFISS AFB, NY.
Improvement in radar detection under scan to scan processing and scan rate reduction
[AD-A247350] p 3082 N92-27386
Variable hold time in dynamic random access memories
[AD-A248602] p 3144 N92-28063

ROME UNIV. (ITALY).
Evaluation of the effects of finite rate chemistry on nozzle performance p 3101 N92-27488
A boundary integral formulation for unsteady transonic potential flows p 3038 N92-27942
Nonlinear effects in optical fibers
p 3086 N92-28088

ROYAL AEROSPACE ESTABLISHMENT, BEDFORD (ENGLAND).
A review of scale effects on surfaces in unsteady motion p 3042 N92-27962

ROYAL AEROSPACE ESTABLISHMENT, FARNBOROUGH (ENGLAND).
Application of S1BYL2 to the AGARD WG18 compressor test cases p 3094 N92-27452
Predictions and measurements of 3D viscous flow in a transonic turbine nozzle guide vane row
p 3050 N92-27466

ROYAL AIR FORCE, LONDON (ENGLAND).
Interdiction mission planning and co-ordination during the Gulf conflict 17 January - 27 February 1991
p 3031 N92-27888

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
Parallel knowledge based systems architectures for in-flight mission management p 3034 N92-27904

ROYAL SIGNALS AND RADAR ESTABLISHMENT, CHRISTCHURCH (ENGLAND).
A digital satellite delay simulator
[AD-A248386] p 3085 N92-28005

S

SAAB AIRCRAFT CO., LINKOPING (SWEDEN).
Recent applications of linear and nonlinear unsteady aerodynamics for aeroelastic analysis
p 3038 N92-27940

SAN DIEGO STATE UNIV., CA.
Schemas in problem solving: An integrated model of learning, memory, and instruction
[AD-A246882] p 3158 N92-28144

SANDIA NATIONAL LABS., ALBUQUERQUE, NM.
Massively parallel computing, C++, and hydrocode algorithms
[DE92-006739] p 3154 N92-27748
Nonlinear aspects of shock response in isolated accelerometers
[DE92-010827] p 3107 N92-28054

SASKATCHEWAN UNIV., SASKATOON.
Tokamak profiles based on models for the anomalous electron thermal diffusivity
[PPL-125] p 3171 N92-27446
Destabilized ion acoustic transit mode and anomalous transport in tokamaks
[PPL-123] p 3172 N92-27447
Stability of long wavelength modes in tokamaks
[PPL-117] p 3172 N92-27448
Local kinetic analysis of low frequency electrostatic modes in tokamaks
[PPL-110] p 3172 N92-27449
Stabilizing effect of dissipative trapped electrons on the energetic ion modes
[PPL-121] p 3172 N92-27579
Skin size electromagnetic drift mode and anomalous transport
[PPL-119] p 3172 N92-27580
Electromagnetic semi-local kinetic analysis on the electron temperature gradient mode in tokamaks
[PPL-118] p 3173 N92-27581
Electromagnetic microinstability in toroidal plasmas
[PPL-115] p 3173 N92-27582
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-103] p 3173 N92-27648
Analytical formula for ignition access condition in a magnetic fusion reactor
[PPL-114] p 3173 N92-27882
Anomalous electron thermal diffusivity, anomalous particle pinch, and isotope effect due to the skin size electromagnetic drift mode
[PPL-116] p 3173 N92-27883
Operation path method for ignition criterion in a D-T tokamak reactor
[PPL-122] p 3174 N92-28193
Saddle point condition for D-He-3 tokamak fusion reactor
[PPL-106] p 3174 N92-28194
Ballooning and drift-Alfven modes in tokamaks
[PPL-104] p 3174 N92-28195
Effects of temperature gradients on the toroidicity induced drift mode
[PPL-108] p 3175 N92-28196
Local kinetic analysis of the ballooning mode in tokamaks
[PPL-111] p 3175 N92-28197
Electromagnetic and kinetic effects on the ion temperature gradient mode
[PPL-113] p 3175 N92-28198
Effects of kinetic damping on the ion temperature gradient mode in tokamaks
[PPL-105] p 3175 N92-28204
Microballooning mode in tokamaks
[PPL-107] p 3175 N92-28205

SATCON TECHNOLOGY CORP., CAMBRIDGE, MA.
Application of narrow band control to reduce vibrations in magnetic bearing systems p 3057 N92-27729
A six degree-of-freedom Lorentz vibration isolator with nonlinear controller p 3058 N92-27733
An electrostatically suspended, micro-mechanical rate gyroscope p 3064 N92-27810
Performance of a superconducting large-angle magnetic suspension p 3065 N92-27815

SCHAFER (W. J.) ASSOCIATES, INC., WASHINGTON, DC.
LDEF archival system plan p 3188 N92-27324

SCIENCE APPLICATIONS INTERNATIONAL CORP., PROSPECT, TN.
Development and application of a 3-D geometry/mass model for LDEF satellite ionizing radiation assessments
p 3165 N92-27236
Radiation model predictions and validation using LDEF data p 3165 N92-27237
Future directions for LDEF ionizing radiation modeling and assessments p 3165 N92-27242

SCIENCE APPLICATIONS INTERNATIONAL CORP., SAN DIEGO, CA.
Laser radar system demonstration: System requirements review, second demonstration receiver
[AD-A246159] p 3108 N92-27601

SCIENCE APPLICATIONS INTERNATIONAL CORP., SANTA MONICA, CA.
LDEF space optics handbook p 3171 N92-27311

SCIENTIFIC RESEARCH ASSOCIATES, INC., GLASTONBURY, CT.
Phenomena unique to sub-micrometer devices
[AD-A246655] p 3091 N92-27759
Numerical simulation of the function of scientific instrumentation for measuring the speed of electron devices
[AD-A247006] p 3093 N92-28137

SENSIS CORP., DEWITT, NY.
Integrated multi-domain radar demonstration
[AD-A246653] p 3084 N92-27758

SHEFFIELD UNIV. (ENGLAND).
A simplified nonlinear model for a Combined Heat and Power (CHP) system
[RR-416] p 3081 N92-27926
SAR calibration and principal component analysis
p 3088 N92-28029

SOCIETE EUROPEENNE DE PROPULSION, VERNON (FRANCE).
Magnetic bearings: A key technology for advanced rocket engines? p 3057 N92-27725

SOUTH CAROLINA RESEARCH AUTHORITY, CHARLESTON.
PDES Application Protocol Suite for Composites (PAS-C): State-Of-The-Art (SOTA) assessment for the PAS-C program
[AD-A247921] p 3069 N92-27849

SOUTHAMPTON UNIV. (ENGLAND).
Magnetic suspension using high temperature superconducting cores p 3061 N92-27789
Wind tunnel magnetic Suspension Systems at the University of Southampton, England
p 3053 N92-27804
Active fibres and optical amplifiers
p 3086 N92-28089

SOUTHERN METHODIST UNIV., DALLAS, TX.
Synthesis and characterization of new poly(alkyl/arylphosphazenes)
[AD-A245380] p 3076 N92-27442
SOUTHWEST RESEARCH INST., SAN ANTONIO, TX.
The relationship between fuel lubricity and diesel injection system wear
[AD-A247927] p 3110 N92-27851
Chemical analysis of aromatics in diesel fuels
[PB92-167311] p 3072 N92-28207
SPARTA, INC., LEXINGTON, MA.
Four-dimensional interconnect experimental development
[AD-A247287] p 3106 N92-27385
SPECTRA RESEARCH SYSTEMS, INC., HUNTSVILLE, AL.
Computer graphics for bearing dynamic analysis
[AD-A247567] p 3148 N92-27584
SPIRE CORP., BEDFORD, MA.
Advanced baffle materials technology development
[AD-A247935] p 3169 N92-27826
SRI INTERNATIONAL CORP., MENLO PARK, CA.
Space applications of diamagnetic suspensions
p 3064 N92-27808
An evolutionary approach to designing neural networks
[AD-A247003] p 3157 N92-27987
ST SYSTEMS CORP., PACIFIC GROVE, CA.
Navy Atmospheric Boundary Layer (NABL) model system: Software/Interface requirements specification
[AD-A247501] p 3127 N92-27922
STANFORD LINEAR ACCELERATOR CENTER, CA.
SLAC B Factory computing
[DE92-010745] p 3154 N92-27368
Simulation of tail distributions in electron-positron circular colliders
[DE92-010743] p 3166 N92-27413
HippoDraw and Hippoplotamus
[DE92-010744] p 3146 N92-27414
Perturbation theory in light-cone quantization
[DE92-011076] p 3167 N92-27419
SLAC workshop on high energy electroproduction and spin physics
[DE92-011077] p 3166 N92-28045
Estimation of oblique electroweak corrections
[DE92-010742] p 3179 N92-28160
Amplification and damping of synchrotron oscillations via a parametric process
[DE92-010748] p 3166 N92-28174
STANFORD UNIV., CA.
Laser physics and laser techniques
[AD-A247326] p 3107 N92-27354
Coherent analog FM-SCM video transmission using direct frequency modulation of semiconductor lasers
[AD-A247574] p 3108 N92-27566
STARNET: An integrated services broadband optical network with physical star topology
[AD-A247555] p 3167 N92-27595
Minimum polarization modulation: A highly bandwidth efficient coherent optical modulation scheme
[AD-A247556] p 3167 N92-27596
Subcarrier-multiplexed coherent optical video transmission using direct frequency modulation of semiconductor lasers
[AD-A247618] p 3167 N92-27597
Space division switches based on semiconductor optical amplifiers
[AD-A247619] p 3176 N92-27598
Space-division optical switches based on semiconductor optical amplifiers
[AD-A247616] p 3167 N92-27608
Finite element methods for fluids
p 3102 N92-27673
Identification of driver gas-associated Bz events and prediction of their orientation
[AD-A248480] p 3194 N92-28059
Research into the design and implementation of knowledge-base system
[AD-A247039] p 3151 N92-28075
Gradient estimation for ratios
[AD-A248453] p 3160 N92-28140
Individual differences in adaptive processing in complex learning and cognitive performance
[AD-A248586] p 3142 N92-28179
Conditions for the applicability of the regenerative method
[AD-A248598] p 3160 N92-28182
STRATHCLYDE UNIV., GLASGOW (SCOTLAND).
Smart structures: The relevance of fibre optics
p 3086 N92-28091
SYSTEMS CONTROL TECHNOLOGY, INC., ARLINGTON, VA.
Composite profiles of helicopter mishaps at heliports and airports
[AD-A248687] p 3043 N92-28052

T

TATA INST. OF FUNDAMENTAL RESEARCH, BOMBAY (INDIA).
Deformations of complex structures on gamma/SL2(C) and cohomology of local systems p 3161 N92-27556
TECHNICAL UNIV. OF DENMARK, LYNGBY.
Follow up on the crystal growth experiments of the LDEF p 3178 N92-27268
TECHNION - ISRAEL INST. OF TECH., HAIFA.
Theory and application of random fields
[AD-A246958] p 3159 N92-27334
TECHNISCHE HOCHSCHULE, AACHEN (GERMANY, F.R.).
Experimental investigation of the unsteady pressure field around an oscillating blade
[MITT-90-01] p 3094 N92-27407
Computational techniques for solving the Navier-Stokes equations p 3094 N92-27451
TECHNISCHE UNIV., AACHEN (GERMANY, F.R.).
Application of finite element method to hypersonic nozzle flow computations p 3099 N92-27479
TECHNOLOGY SYSTEMS, INC., NORTH EDGECOMB, ME.
Development of the Basic Flight Instruction Tutoring System (BFITS)
[AD-A246458] p 3052 N92-27836
TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE.
Real-valued composite filters for correlation-based optical pattern recognition
[NASA-CR-190405] p 3169 N92-27873
TENNESSEE UNIV., KNOXVILLE.
A method to determine moisture profiles from total moisture weight-gain data in polymeric composites
[AD-A247449] p 3077 N92-27550
Residual thermal stresses in graphite/PEEK (APC-2) laminates
[AD-A247450] p 3077 N92-27592
TETRA TECH, INC., SAN DIEGO, CA.
High speed local area networks p 3086 N92-28087
TEXAS A&M UNIV., COLLEGE STATION.
The viscoelastic characterization of polymer materials exposed to the low-Earth orbit environment
p 3079 N92-27283
Macrocycles containing tin
[AD-A246866] p 3163 N92-27351
Radiation, scattering, and guidance of electromagnetic fields by arbitrarily shaped structures embedded in layered dielectric media
[AD-A248951] p 3085 N92-28066
AFRAPT Program at Texas A and M University research for advanced aircraft engine structures
[AD-A247040] p 3049 N92-28076
Advanced user interface capabilities for application on portable computers
[AD-A247295] p 3144 N92-28177
TEXAS CHRISTIAN UNIV., FORT WORTH.
Synthesis and characterization of new poly(alkyl/arylphosphazenes)
[AD-A245380] p 3076 N92-27442
TEXAS UNIV., EL PASO.
Determination of shear wave velocity structure in the Rio Grande rift through receiver function and surface wave analysis, appendix B
[AD-A246937] p 3128 N92-28072
TEXAS UNIV. AT DALLAS, RICHARDSON.
Proof of the feasibility of coherent and incoherent schemes for pumping a gamma ray laser
[AD-A245372] p 3107 N92-27438
TEXTRON LYCOMING, STRATFORD, CT.
Application of CFD in the design of gas turbine engine components p 3049 N92-27461
TQ AND C ASSOCIATES, INC., FALMOUTH, VA.
Vibration damping of elastic waves in electrically conducting media subjected to high magnetic fields
p 3060 N92-27746
The concept of the mechanically active guideway as a novel approach to maglev p 3064 N92-27807
THOMSON-CSF, BAGNEUX (FRANCE).
Air situation establishment in a mobile multisensor environment p 3031 N92-27891
THREE C SYSTEMS, INC., WYNNEWOOD, PA.
Development of tungsten based composites
[AD-A246408] p 3069 N92-27819
TOLEDO UNIV., OH.
Users manual and modeling improvements for axial turbine design and performance computer code TD2-2
[NASA-CR-189118] p 3035 N92-27376
TORONTO UNIV. (ONTARIO).
Analysis of LDEF micrometeoroid/debris data and damage to composite laminates p 3070 N92-27248
LDEF results for polymer matrix composite experiment AO 180 p 3079 N92-27288
Momentum transport by cumulus clouds and its parameterization
[ISBN-0-315-54644-1] p 3129 N92-27610
Topics in galactic dynamics
[ISBN-0-315-47774-1] p 3190 N92-27611
Optimal control of large space structures using distributed gyricity: A continuum approach
[ISBN-0-315-56953-0] p 3056 N92-27612
On the stability of a dual spin satellite with asymmetric rotor and flexible platform
[ISBN-0-315-54650-6] p 3056 N92-27613
Pitch-heave dynamics models for an air cushion vehicle
[ISBN-0-315-51095-1] p 3036 N92-27624
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[UTIAS-337] p 3116 N92-27633
A study of the diffuse interstellar medium through neutral hydrogen absorption observations toward pulsars
[ISBN-0-315-54703-0] p 3189 N92-27644
The modelling of turbulence and downbursts for flight simulators
[ISBN-0-315-59945-6] p 3051 N92-27645
An experimental study of hypersonic flow development in a pipe
[UTIAS-TN-275] p 3103 N92-27683
The incidence and nature of absorption line profile variations among the O stars
[ISBN-0-315-56945-X] p 3189 N92-27684
Observational analysis of the magneto-ionic plasma within and around extragalactic radio sources
[ISBN-0-315-56913-1] p 3195 N92-27685
Gravitational clustering of galaxies: Distribution of galaxy counts in cells
[ISBN-0-315-59910-3] p 3190 N92-27687
Fluctuations for galaxy formation from inflation models
[ISBN-0-315-54662-X] p 3191 N92-27690
Dual wavelength fiber-optic polarimeter for path-integrated strain sensing: Application to the measurement of local slope on a flexible beam
[ISBN-0-315-59931-6] p 3117 N92-28158
TRW SPACE AND DEFENSE SECTOR, REDONDO BEACH, CA.
Optical characterization of contaminant film
p 3170 N92-27308
TRW SPACE TECHNOLOGY LABS., REDONDO BEACH, CA.
Technology for the Mission to Planet Earth
[NASA-TM-107952] p 3126 N92-28222
TSINGHUA UNIV., BEJING (CHINA).
Computer aided design of digital controller for radial active magnetic bearings p 3060 N92-27744
TUFTS UNIV., MEDFORD, MA.
VLA, PHOENIX and BATSE observations of an X1 flare
[AD-A248461] p 3194 N92-27935

U

UNITED TECHNOLOGIES OPTICAL SYSTEMS, INC., WEST PALM BEACH, FL.
Navier-Stokes analysis of turbine blade heat transfer and performance p 3097 N92-27468
UNIVERSITAET DER BUNDESWEHR MUENCHEN, NEUBIBERG (GERMANY, F.R.).
Framework optimization using stochastic gradient process
[ETN-92-90828] p 3159 N92-27406
Knowledge-based planning for controlled airspace flight operation as part of a cockpit assistant
p 3032 N92-27895
UNIVERSITY COLL. OF SWANSEA (WALES).
Numerical representation of heat transfer into turbine blade cooling ducts p 3098 N92-27474
Unstructured grid methods for compressible flows
p 3103 N92-27676
UNIVERSITY OF NORTHERN ILLINOIS, DE KALB.
Estimating the reliability of a system on the basis of sample paths
[AD-A248585] p 3115 N92-28171
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
The eddy structures in bounded shear flows
p 3037 N92-27712
Stimulated scattering and phase conjugation in photorefractive materials
[AD-A246903] p 3168 N92-27716
Human image understanding
[AD-A247048] p 3140 N92-27825
Mathematical and numerical analysis aspects of quasi-neural networks
[AD-A248583] p 3158 N92-28061

UNIVERSITY OF SOUTHERN MISSISSIPPI, BAY SAINT LOUIS.
AIRSAR observations of the Gulf Stream with interpretation from sea truth and modeling
p 3121 N92-28023
UNIVERSITY OF WESTERN ONTARIO, LONDON.
Hydrogenic ion recombination
[AD-A246886] p 3072 N92-28145
UNIVERSITY OF WESTERN WASHINGTON, BELLINGHAM.
Characterization of semi-insulating gallium arsenide
[AD-A246511] p 3177 N92-27632
UTAH STATE UNIV., LOGAN.
The interstellar gas experiment: Analysis in progress
p 3145 N92-27266
Ionospheric gravity wave measurements with the USU dynasonde
[NASA-CR-190125] p 3127 N92-27434
Measurements of mesospheric winds and waves
[AD-A247181] p 3130 N92-27696

V

VANDERBILT UNIV., NASHVILLE, TN.
Mechanical properties of glasses impacted by debris or micrometeorites p 3078 N92-27247
VICTORIA UNIV. (BRITISH COLUMBIA).
Clustering of faint galaxies
[ISBN-0-315-53743-4] p 3189 N92-27686
Bose-Einstein correlations in proton-antiproton collisions at square root of s equals 200 to 900 GeV
[ISBN-0-315-50129-4] p 3164 N92-27691
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
A computational study of tip leakage flow and losses in a linear turbine cascade p 3095 N92-27453
A new composite roughness surface scattering model
[AD-A248891] p 3085 N92-27970
VIRGINIA UNIV., CHARLOTTESVILLE.
Professor Jesse W. Beams and the first practical magnetic suspension p 3057 N92-27723
Stability and performance of notch filter control for unbalance response p 3058 N92-27731
A six degree-of-freedom magnetic bearing for microgravity vibration isolation p 3058 N92-27732
Low power magnetic bearing design for high speed rotating machinery p 3059 N92-27739
Extended H2 synthesis for multiple degree-of-freedom controllers p 3059 N92-27741
A microgravity vibration isolation rig
p 3060 N92-27745
Design of bearings for rotor systems based on stability
p 3063 N92-27799
VISIDYNE, INC., BURLINGTON, MA.
The design, development, and test of balloonborne and groundbased lidar systems. Volume 2: Flight test of Atmospheric Balloon Lidar Experiment, ABLE 2
[AD-A246727] p 3087 N92-28103
VON KARMAN INST. FOR FLUID DYNAMICS, RHODE-SAINT-GENESE (BELGIUM).
Multidimensional upwind methods for unstructured grids p 3102 N92-27675
Higher order upwind finite volume schemes with ENO-properties for general unstructured meshes
p 3103 N92-27678
A frontal approach for node generation in Delaunay triangulations p 3103 N92-27680
VRIJE UNIV., BRUSSELS (BELGIUM).
An integrated CFD system for 3D turbomachinery applications p 3050 N92-27464

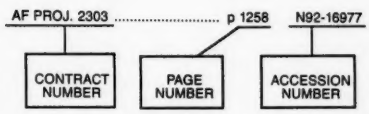
W

WALTER REED ARMY INST. OF RESEARCH, WASHINGTON, DC.
Characterization of peak inspiratory flow and alveolar ventilation during maximal arm crank exercise with and without inspiratory airflow resistance
[AD-A247298] p 3143 N92-27990
WASHINGTON UNIV., SAINT LOUIS, MO.
SIMS chemical analysis of extended impacts on the leading and trailing edges of LDEF experiment AO187-2
p 3193 N92-27259
Research and development of the p-version of the finite element model
[AD-A248582] p 3158 N92-28060
WASHINGTON UNIV., SEATTLE.
Asymptotic properties of a stochastic EM algorithm for estimating mixing proportions
[AD-A246263] p 3148 N92-27661
Environmental measurements in the Beaufort Sea, spring 1991
[AD-A247928] p 3125 N92-27846
Fluctuations and squeezing in resonance fluorescence emitted near a phase conjugator
[AD-A248735] p 3170 N92-28125
WATERLOO UNIV. (ONTARIO).
Theory of multilayer dielectric planar waveguides and its applications
[ISBN-0-315-49255-4] p 3168 N92-27625
WESTINGHOUSE SAVANNAH RIVER CO., AIKEN, SC.
Tritium measurement technique using in-bed calorimetry
[DE92-010061] p 3079 N92-27363
Evaluation of the capacity of welded attachments to elbows as compared to the methodology of ASME Code Case N-318
[DE92-009408] p 3117 N92-28041
Reviews of computing technology: A review of compound document architectures
[DE92-011375] p 3151 N92-28048
WISCONSIN UNIV., MADISON.
Spectroscopy, reaction, and photodissociation in highly vibrationally excited molecules
[DE92-010651] p 3163 N92-27396
Nonlinear analysis techniques for shear band formations at high strain-rates
[AD-A248584] p 3117 N92-28178
WOODS HOLE OCEANOGRAPHIC INST., MA.
Hydrographic data from the 10 deg N trans-Pacific cruise R/V MOANA WAVE Cruise No. 89-03, -4, -6
[PB92-170224] p 3133 N92-27515
Software tools for acoustic database management
[AD-A247636] p 3181 N92-27553
WRIGHT LAB., EGLIN AFB, FL.
Investigation of battery charged capacitor pulsed power systems for electromagnetic launcher experiments
[AD-A247325] p 3089 N92-27353
WRIGHT LAB., WRIGHT-PATTERSON AFB, OH.
Turbine internal fluid flow analysis and Stokes' hypothesis p 3095 N92-27455
The effect of jet fuel exposure on advanced aerospace composites. Part 1: Thermal and chemical analysis
[AD-A246559] p 3068 N92-27531
Add-on damping treatment for life extension of the F-15 upper-outer wing skin
[AD-A246149] p 3050 N92-27577
Foreign object damage to tires operating in a wartime environment
[AD-A247195] p 3043 N92-27682
Unsteady aerodynamics for aeroelasticity at the Flight Dynamics Directorate p 3038 N92-27939

Y

YALE UNIV., NEW HAVEN, CT.
Stress-induced enhancement of the startle reflex
[AD-A247096] p 3140 N92-27839
YORK UNIV. (ONTARIO).
The observable effects of gravity waves on airglow emissions
[ISBN-0-315-57927-7] p 3127 N92-27620
Laboratory measurements of the transmission and scattering of laser beams in optically dense clouds
[ISBN-0-315-58085-2] p 3108 N92-27647
A comparison of the measured and modelled effects of brewster angle anisotropies upon pulsed XeCl excimer laser output
[ISBN-0-315-49569-3] p 3109 N92-27698

Typical Contract Number Index Listing

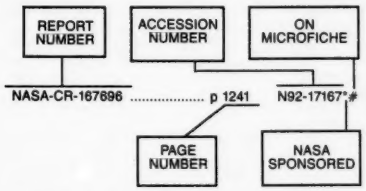


Listings in this index are arranged alphanumerically by contract number. Under each contract number the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The page number helps to locate the citation in the abstract section. The accession number denotes the number by which the citation is identified.

AERO-0003-C ..... p 3102 N92-27675
AF PROJ. 2338 ..... p 3144 N92-28063
AF PROJ. 2420 ..... p 3071 N92-27514
AF PROJ. 4519 ..... p 3170 N92-28181
AF PROJ. 7659 ..... p 3130 N92-27845
AF-AFOSR-0017-88 ..... p 3158 N92-28060
AF-AFOSR-0019-89 ..... p 3109 N92-28051
AF-AFOSR-0035-91 ..... p 3140 N92-27839
AF-AFOSR-0042-89 ..... p 3105 N92-28062
AF-AFOSR-0042-90 ..... p 3072 N92-28145
AF-AFOSR-0048-89 ..... p 3194 N92-27841
AF-AFOSR-0050-88 ..... p 3128 N92-27336
AF-AFOSR-0064-90 ..... p 3101 N92-27546
AF-AFOSR-0066-91 ..... p 3151 N92-28075
AF-AFOSR-0079-87 ..... p 3117 N92-28138
AF-AFOSR-0085-90 ..... p 3127 N92-27963
AF-AFOSR-0093-91 ..... p 3131 N92-27988
AF-AFOSR-0096-90 ..... p 3105 N92-28175
AF-AFOSR-0104-89 ..... p 3196 N92-28147
AF-AFOSR-0111-88 ..... p 3071 N92-27510
AF-AFOSR-0125-90 ..... p 3141 N92-28094
AF-AFOSR-0147-89 ..... p 3194 N92-27935
AF-AFOSR-0156-86 ..... p 3174 N92-28195
p 3175 N92-28205
AF-AFOSR-0206-88 ..... p 3138 N92-27337
AF-AFOSR-0231-88 ..... p 3140 N92-27825
AF-AFOSR-0235-87 ..... p 3137 N92-27844
AF-AFOSR-0236-90 ..... p 3065 N92-27862
AF-AFOSR-0238-89 ..... p 3138 N92-27331
AF-AFOSR-0245-88 ..... p 3158 N92-28061
AF-AFOSR-0245-89 ..... p 3141 N92-27989
AF-AFOSR-0247-90 ..... p 3094 N92-27352
AF-AFOSR-0252-89 ..... p 3158 N92-28189
AF-AFOSR-0261-89 ..... p 3159 N92-27334
AF-AFOSR-0268-88 ..... p 3139 N92-27512
AF-AFOSR-0297-86 ..... p 3049 N92-28076
AF-AFOSR-0317-90 ..... p 3138 N92-28135
AF-AFOSR-0323-88 ..... p 3142 N92-28176
AF-AFOSR-0332-91 ..... p 3138 N92-27968
AF-AFOSR-0364-90 ..... p 3072 N92-28064
AF-AFOSR-0370-90 ..... p 3142 N92-28170
AF-AFOSR-0402-90 ..... p 3115 N92-28171
AF-AFOSR-0414-89 ..... p 3141 N92-28050
AF-AFOSR-0517-89 ..... p 3142 N92-28179
AF-AFOSR-1491-89 ..... p 3071 N92-27853
ARB-A932-125 ..... p 3072 N92-28207
ARPA ORDER 8100 ..... p 3093 N92-28130
BMVG-T/R-760/I-0014/I-1714 ..... p 3080 N92-27927
DA PROJ. M00-96 ..... p 3142 N92-28164
DA PROJ. RR0-4209 ..... p 3163 N92-28011
DA PROJ. 1L1-61102-AH-43 ..... p 3158 N92-27834
DA PROJ. 1L1-62101-AH-84 ..... p 3069 N92-27752
DA PROJ. 1L1-62211-A-47A ..... p 3111 N92-27879
DA PROJ. 1L2-63001-D-150 ..... p 3110 N92-27851
DA PROJ. 3M1-61102-BS-15 ..... p 3143 N92-27990
DA PROJ. 3M1-62787-A-878 ..... p 3143 N92-27991
DA PROJ. 4A1-61102-AT-24 ..... p 3115 N92-27573
DAAA22-86-D-0278 ..... p 3115 N92-27213
DAAG29-85-C-0008 ..... p 3160 N92-27423
DAAH01-91-C-R184 ..... p 3091 N92-27759
DAAL02-89-C-0040 ..... p 3084 N92-27855
DAAL03-86-D-0001 ..... p 3044 N92-28079
DAAL03-87-K-0112 ..... p 3178 N92-28218
DAAL03-88-K-0035 ..... p 3076 N92-27442
DAAL03-88-K-0184 ..... p 3077 N92-27545
DAAL03-88-K-0185 ..... p 3117 N92-28178
DAAL03-89-K-0041 ..... p 3093 N92-28141
DAAL03-89-K-0137 ..... p 3085 N92-27970
DAAL03-91-G-0101 ..... p 3160 N92-28140
p 3160 N92-28182
DAAL04-87-C-0036 ..... p 3169 N92-27826
DAAL04-91-C-0012 ..... p 3069 N92-27819
DAAL04-91-C-0013 ..... p 3089 N92-27827
DAJA45-85-C-0038 ..... p 3141 N92-27971
DAJA45-89-C-0006 ..... p 3049 N92-28073
DCIEM-W7711-9-7091-01-XSE ..... p 3143 N92-27358
DE-AC01-89ER-30148 ..... p 3109 N92-27394
DE-AC02-76CH-00016 ..... p 3074 N92-27913
DE-AC03-76SF-00098 ..... p 3126 N92-27347
p 3161 N92-27348
p 3136 N92-27349
p 3164 N92-28047
DE-AC03-76SF-00515 ..... p 3154 N92-27368
p 3166 N92-27413
p 3146 N92-27414
p 3167 N92-27419
p 3168 N92-28045
p 3179 N92-28160
p 3166 N92-28174
DE-AC04-76DP-00789 ..... p 3154 N92-27748
p 3107 N92-28054
DE-AC05-84OR-21400 ..... p 3171 N92-27362
p 3075 N92-27364
p 3147 N92-27570
p 3154 N92-28173
DE-AC06-76RL-01830 ..... p 3089 N92-27395
DE-AC07-76ID-01570 ..... p 3115 N92-28055
DE-AC09-89SR-18035 ..... p 3079 N92-27363
p 3117 N92-28041
p 3151 N92-28048
DE-FG02-86ER-13500 ..... p 3163 N92-27396
DE-FG02-86ER-250125 ..... p 3158 N92-27909
DE-FG02-88ER-13847 ..... p 3072 N92-28043
DE-FG02-88ER-13864 ..... p 3072 N92-28046
DE-FG02-88ER-40479 ..... p 3194 N92-27415
DE-FG02-89ER-53285 ..... p 3174 N92-28057
DE-FG03-88ER-45360 ..... p 3074 N92-27416
DE-FG05-89ER-80688 ..... p 3188 N92-28042
DE-FG07-88ER-12821 ..... p 3107 N92-27393
DNA001-88-C-0046 ..... p 3071 N92-27835
DND PROJ. 021LA ..... p 3084 N92-27695
DSS-055SS.W7714-8-5726 ..... p 3137 N92-27702
DTCG23-86-C-20062 ..... p 3075 N92-28139
DTFA01-87-C-0014 ..... p 3043 N92-28052
DTFA01-90-Y-01009 ..... p 3180 N92-27518
DTFA03-86-C-00042 ..... p 3047 N92-27973
ERI PROJ. 3067 ..... p 3048 N92-27519
FL2878-87-0-0021 ..... p 3178 N92-28165
FQ8671-90-01600 ..... p 3106 N92-27385
F04701-88-C-0089 ..... p 3073 N92-27298
F19628-86-C-0105 ..... p 3087 N92-28103
F19628-86-K-0133 ..... p 3092 N92-27992
F19628-87-C-0065 ..... p 3044 N92-27964
F19628-87-C-0094 ..... p 3047 N92-28004
F19628-88-D-0031 ..... p 3150 N92-27919
F19628-88-K-0012 ..... p 3168 N92-27756
F19628-89-C-0001 ..... p 3085 N92-27864
p 3185 N92-27997
F19628-89-K-0013 ..... p 3126 N92-27380
F19628-90-C-0002 ..... p 3176 N92-27216
p 3047 N92-27424
p 3160 N92-27915
F19628-90-C-0119 ..... p 3127 N92-27594
F29601-89-C-0014 ..... p 3106 N92-27993
F30602-88-D-0025 ..... p 3091 N92-27847
F30602-89-C-0045 ..... p 3084 N92-27758
F30602-91-C-0010 ..... p 3151 N92-28082
F33615-85-C-5094 ..... p 3111 N92-27996
F33615-87-C-2748 ..... p 3103 N92-27683
F33615-87-D-0627 ..... p 3144 N92-28177
F33615-88-C-5404 ..... p 3074 N92-28053
F33615-89-C-0009 ..... p 3052 N92-27836
F33615-89-C-0603 ..... p 3044 N92-27916
F33615-89-C-2971 ..... p 3107 N92-28217
F33615-90-C-0005 ..... p 3140 N92-27863
F33615-90-C-2032 ..... p 3163 N92-27210
F33615-90-C-3211 ..... p 3116 N92-27865
F33615-91-C-2133 ..... p 3148 N92-27584
F33615-91-C-5713 ..... p 3069 N92-27849
F33657-88-D-0076 ..... p 3119 N92-27881
F49620-85-C-0080 ..... p 3037 N92-27712
F49620-88-C-0095 ..... p 3168 N92-27716
F49620-88-C-0113 ..... p 3093 N92-28137
F49620-89-C-0022 ..... p 3130 N92-27696
F49620-89-K-0005 ..... p 3157 N92-27987
F49620-90-C-0076 ..... p 3218 N92-28078
p 3218 N92-28096
p 3218 N92-28097
p 3219 N92-28098
p 3219 N92-28099
p 3219 N92-28109
p 3219 N92-28110
p 3219 N92-28111
p 3219 N92-28127
p 3219 N92-28128
F49620-91-C-0002 ..... p 3106 N92-27385
F49620-91-C-0037 ..... p 3105 N92-27986
F49620-91-C-0042 ..... p 3105 N92-27918
F498201-89-K-0004 ..... p 3107 N92-27354
GR/F/70495 ..... p 3099 N92-27480
GRI-5089-296-1941 ..... p 3081 N92-27715
MDA903-87-K-0652 ..... p 3141 N92-27969
MDA903-89-K-0078 ..... p 3070 N92-28202
MDA903-90-C-0006 ..... p 3110 N92-27439
p 3184 N92-27536
MIPR-FQ761900016 ..... p 3170 N92-28181
MIPR-FY1457-87-N5054 ..... p 3071 N92-27514
NAGW-1175 ..... p 3173 N92-27866
NAGW-1272 ..... p 3119 N92-27559
NAGW-1682 ..... p 3186 N92-28115
p 3186 N92-28155
p 3187 N92-28184
NAGW-1809 ..... p 3103 N92-27676
NAGW-478 ..... p 3103 N92-27676
NAG1-1219 ..... p 3083 N92-27520
NAG2-268 ..... p 3147 N92-27561
p 3148 N92-27626
NAG2-513 ..... p 3157 N92-27557
NAG2-680 ..... p 3147 N92-27560
NAG2-708 ..... p 3035 N92-27558
NAG3-1165 ..... p 3035 N92-27376
NAG3-808 ..... p 3074 N92-27542
NAG3-917 ..... p 3048 N92-27519
NAG5-1169 ..... p 3089 N92-27404
NAG5-1341 ..... p 3127 N92-27434
NAG5-890 ..... p 3118 N92-27543
NAG8-168 ..... p 3165 N92-27233
p 3165 N92-27235
NAG8-678 ..... p 3196 N92-27876
NAG9-521 ..... p 3169 N92-27873
NASA ORDER C-22742-P ..... p 3105 N92-27975
NASA ORDER L-91172-C ..... p 3047 N92-27424
NASW-4435 ..... p 3054 N92-27540
p 3055 N92-27541
p 3055 N92-27555
NAS1-18584 ..... p 3116 N92-27874
NAS1-18605 ..... p 3155 N92-27770
NAS1-18845 ..... p 3052 N92-27801
NAS1-18878 ..... p 3153 N92-27586
NAS1-19282 ..... p 3064 N92-27810
NAS10-10285 ..... p 3136 N92-27877
NAS10-11624 ..... p 3136 N92-27877
NAS3-22767 ..... p 3116 N92-27872
NAS5-30343 ..... p 3114 N92-27649
NAS5-30680 ..... p 3083 N92-27516
p 3182 N92-27972
NAS5-31260 ..... p 3055 N92-28219
NAS5-31500 ..... p 3158 N92-28210
p 3194 N92-28221
NAS7-918 ..... p 3119 N92-28013
NAS8-36955 ..... p 3169 N92-27871
NAS8-37585 ..... p 3159 N92-27588
NAS8-38566 ..... p 3164 N92-27229
p 3165 N92-27236
p 3165 N92-27237
p 3165 N92-27242
NAS8-38610 ..... p 3165 N92-27232

	p 3165	N92-27234
NAS8-39184	p 3066	N92-27403
NAS9-18426	p 3051	N92-28209
NCCW-8	p 3103	N92-27676
NCC1-98	p 3104	N92-27880
NCC1-99	p 3149	N92-27829
	p 3149	N92-27831
NCC2-465	p 3035	N92-27399
NCC2-604	p 3052	N92-27976
	p 3052	N92-27977
NCC3-124	p 3035	N92-27377
NCC9-16	p 3183	N92-27397
	p 3181	N92-27572
	p 3148	N92-27585
	p 3152	N92-28150
NIVR-01904N	p 3039	N92-27947
NIVR-07801N	p 3041	N92-27958
NR PROJ. RR1-309	p 3077	N92-27704
NR PROJ. R31-0300	p 3134	N92-27604
NR PROJ. X05-013	p 3134	N92-27574
NSF ATM-90-00171	p 3127	N92-27434
NSF DMS-88-02858	p 3158	N92-27909
NSF OCE-87-16910	p 3133	N92-27515
NSF OCE-88-12576	p 3133	N92-27515
N00014-81-C-0463	p 3177	N92-27985
N00014-82-K-0084	p 3037	N92-27712
N00014-84-K-0352	p 3092	N92-27965
N00014-84-K-0734	p 3154	N92-27755
N00014-85-K-0645	p 3074	N92-27542
N00014-86-C-0421	p 3089	N92-27401
N00014-86-C-0838	p 3176	N92-27381
N00014-86-K-0553	p 3080	N92-27562
N00014-86-K-0679	p 3037	N92-27712
N00014-86-K-0692	p 3109	N92-28124
	p 3109	N92-28131
N00014-87-K-0238	p 3151	N92-28068
N00014-87-K-0243	p 3078	N92-28148
N00014-87-K-0352	p 3049	N92-27817
N00014-88-C-0433	p 3176	N92-27402
N00014-88-C-2206	p 3090	N92-27656
N00014-88-C-2278	p 3108	N92-27601
N00014-88-K-0273	p 3181	N92-27553
N00014-88-K-0309	p 3077	N92-27704
N00014-88-K-0670	p 3104	N92-27886
N00014-88-K-0729	p 3134	N92-27583
N00014-89-J-1143	p 3158	N92-28144
N00014-89-J-1152	p 3135	N92-27908
N00014-89-J-1214	p 3163	N92-27351
N00014-89-J-1235	p 3177	N92-28077
N00014-89-J-1238	p 3080	N92-27631
	p 3081	N92-28161
N00014-89-J-1635	p 3131	N92-27199
N00014-89-J-1848	p 3092	N92-28080
	p 3178	N92-28081
N00014-89-J-3170	p 3075	N92-28136
N00014-89-J-3237	p 3091	N92-27869
N00014-89-K-2016	p 3077	N92-27837
N00014-90-C-0226	p 3092	N92-28067
N00014-90-F-0011	p 3167	N92-27599
N00014-90-J-1051	p 3135	N92-28010
N00014-90-J-1161	p 3077	N92-27867
N00014-90-J-1193	p 3170	N92-28125
N00014-90-J-1197	p 3085	N92-28066
N00014-90-J-1198	p 3171	N92-27330
N00014-90-J-1235	p 3091	N92-27840
N00014-90-J-1556	p 3077	N92-27550
	p 3077	N92-27592
N00014-90-J-1811	p 3151	N92-28082
N00014-90-J-1989	p 3164	N92-28008
	p 3072	N92-28009
N00014-90-J-4008	p 3140	N92-27538
N00014-90-K-2001	p 3107	N92-27438
N00014-90-K-2023	p 3177	N92-27705
N00014-90-P-2030	p 3177	N92-27632
N00014-91-C-0091	p 3069	N92-27761
N00014-91-C-0117	p 3161	N92-27854
N00014-91-C-0216	p 3093	N92-28130
N00014-91-C-0233	p 3047	N92-27925
N00014-91-C-0247	p 3069	N92-27749
N00014-91-J-1074	p 3148	N92-27661
N00014-91-J-1243	p 3140	N92-27822
N00014-91-J-1283	p 3145	N92-27211
N00014-91-J-1299	p 3074	N92-27821
N00014-91-J-1409	p 3164	N92-28105
	p 3072	N92-28120
N00014-91-J-1446	p 3104	N92-27757
N00014-91-J-1546	p 3139	N92-27509
N00014-91-J-1575	p 3049	N92-27817
N00014-91-J-1608	p 3052	N92-27753
N00014-91-J-1857	p 3108	N92-27566
	p 3167	N92-27595
	p 3167	N92-27596
	p 3167	N92-27597
	p 3176	N92-27598
	p 3167	N92-27608
N00014-91-J-1872	p 3154	N92-27389
N00014-91-J-1927	p 3168	N92-27720
	p 3093	N92-28121
	p 3072	N92-28122
N00014-91-J-1985	p 3150	N92-27995
N00019-88-C-0051	p 3046	N92-27982
N00039-91-C-0072	p 3125	N92-27846
N00140-88-C-0677	p 3097	N92-27468
RICIS PROJ. ET-28	p 3152	N92-28150
RICIS PROJ. RB-04	p 3183	N92-27397
RICIS PROJ. SR-01	p 3181	N92-27572
	p 3148	N92-27585
RTOP 196-88-00-03	p 3196	N92-27218
RTOP 472-46-07-17	p 3117	N92-27974
RTOP 505-61-41-02	p 3051	N92-27670
RTOP 505-62-20	p 3102	N92-27653
RTOP 505-62-40	p 3042	N92-28102
RTOP 505-62-52	p 3035	N92-27377
RTOP 505-63-36	p 3111	N92-27879
RTOP 505-63-5A	p 3076	N92-27378
RTOP 505-63-5B	p 3116	N92-27872
RTOP 505-64-10-05	p 3153	N92-27586
RTOP 505-64-10-07	p 3153	N92-27589
RTOP 505-64-12-01	p 3047	N92-27424
RTOP 505-68-32	p 3049	N92-27669
RTOP 505-69-50	p 3035	N92-27376
RTOP 506-41-21	p 3067	N92-27878
RTOP 506-42-72	p 3067	N92-27654
RTOP 506-43-41-01	p 3116	N92-27874
RTOP 533-02-36	p 3048	N92-27379
	p 3048	N92-27587
RTOP 537-02-20	p 3049	N92-27652
RTOP 537-02-23	p 3157	N92-27517
RTOP 590-13-11	p 3105	N92-27975
RTOP 590-14-11-02	p 3056	N92-27721
	p 3061	N92-27788
RTOP 590-14-31-01	p 3115	N92-27375
RTOP 595-11-22	p 3154	N92-27763
RTOP 665-31-00-08-71	p 3119	N92-28013
SBA-4-91-2-0357	p 3066	N92-27403
SERC-GR/E/06824	p 3037	N92-27714
SERC-GR/E/77039	p 3037	N92-27714
SNSF-82.613.0.88	p 3124	N92-27426
W-31-109-ENG-38	p 3176	N92-27345
	p 3073	N92-27346
	p 3195	N92-27390
	p 3123	N92-27392
	p 3176	N92-27409
	p 3110	N92-27410
	p 3161	N92-27411
	p 3076	N92-27412
	p 3125	N92-27571
	p 3125	N92-28056
W-7405-ENG-36	p 3118	N92-28214
W-7405-ENG-48	p 3166	N92-27365
	p 3089	N92-27366
	p 3145	N92-27367
	p 3146	N92-27391
	p 3124	N92-27417
	p 3080	N92-27418
	p 3069	N92-27856

Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The accession number denotes the number by which the citation is identified. The page number helps to locate the citation in the abstract section. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

AATTC-TOP-7-3-530 ..... p 3162 N92-27924 #

AD-A245339 ..... p 3084 N92-27855 #
AD-A245352 ..... p 3131 N92-28039 #
AD-A245364 ..... p 3167 N92-27435 #
AD-A245366 ..... p 3146 N92-27436 #
AD-A245371 ..... p 3157 N92-27437 #
AD-A245372 ..... p 3107 N92-27438 #
AD-A245373 ..... p 3110 N92-27439 #
AD-A245376 ..... p 3160 N92-27440 #
AD-A245377 ..... p 3154 N92-27441 #
AD-A245380 ..... p 3076 N92-27442 #
AD-A245383 ..... p 3108 N92-27443 #
AD-A245384 ..... p 3138 N92-27444 #
AD-A245385 ..... p 3137 N92-27361 #
AD-A245555 ..... p 3185 N92-28040 #
AD-A245775 ..... p 3184 N92-27911 #
AD-A245779 ..... p 3130 N92-27912 #
AD-A245907 ..... p 3081 N92-28161 #
AD-A245910 ..... p 3049 N92-28162 #
AD-A245914 ..... p 3152 N92-28163 #
AD-A245921 ..... p 3115 N92-27573 #
AD-A245923 ..... p 3142 N92-28164 #
AD-A245929 ..... p 3178 N92-28165 #
AD-A245932 ..... p 3106 N92-27857 #
AD-A245936 ..... p 3085 N92-27858 #
AD-A245937 ..... p 3144 N92-28166 #
AD-A245956 ..... p 3147 N92-27544 #
AD-A245962 ..... p 3105 N92-28058 #
AD-A245999 ..... p 3067 N92-27521 #
AD-A246002 ..... p 3146 N92-27522 #
AD-A246009 ..... p 3151 N92-28049 #
AD-A246010 ..... p 3129 N92-27655 #
AD-A246018 ..... p 3069 N92-27827 #
AD-A246020 ..... p 3084 N92-27783 #
AD-A246032 ..... p 3090 N92-27656 #
AD-A246037 ..... p 3108 N92-27657 #
AD-A246038 ..... p 3160 N92-27658 #
AD-A246040 ..... p 3084 N92-27784 #
AD-A246043 ..... p 3091 N92-27785 #
AD-A246044 ..... p 3108 N92-27659 #
AD-A246045 ..... p 3083 N92-27660 #
AD-A246047 ..... p 3083 N92-27600 #
AD-A246055 ..... p 3077 N92-27545 #
AD-A246057 ..... p 3104 N92-27828 #
AD-A246064 ..... p 3158 N92-27834 #
AD-A246065 ..... p 3071 N92-27835 #
AD-A246066 ..... p 3135 N92-27786 #
AD-A246070 ..... p 3130 N92-27787 #
AD-A246080 ..... p 3180 N92-27523 #
AD-A246081 ..... p 3147 N92-27524 #
AD-A246082 ..... p 3153 N92-27525 #
AD-A246086 ..... p 3180 N92-27526 #
AD-A246087 ..... p 3069 N92-27749 #
AD-A246123 ..... p 3049 N92-27817 #
AD-A246129 ..... p 3171 N92-27330 #
AD-A246145 ..... p 3134 N92-27574 #
AD-A246146 ..... p 3134 N92-27575 #
AD-A246147 ..... p 3147 N92-27576 #
AD-A246149 ..... p 3050 N92-27577 #
AD-A246155 ..... p 3159 N92-27578 #
AD-A246159 ..... p 3108 N92-27601 #
AD-A246167 ..... p 3114 N92-27602 #
AD-A246206 ..... p 3173 N92-27603 #
AD-A246218 ..... p 3134 N92-27604 #
AD-A246226 ..... p 3066 N92-27198 #
AD-A246241 ..... p 3131 N92-27199 #
AD-A246248 ..... p 3050 N92-27200 #
AD-A246254 ..... p 3175 N92-27201 #
AD-A246257 ..... p 3162 N92-27202 #
AD-A246258 ..... p 3093 N92-28167 #
AD-A246263 ..... p 3148 N92-27661 #
AD-A246268 ..... p 3090 N92-27662 #
AD-A246269 ..... p 3148 N92-27663 #
AD-A246271 ..... p 3194 N92-27818 #
AD-A246272 ..... p 3143 N92-27664 #
AD-A246350 ..... p 3046 N92-28118 #
AD-A246397 ..... p 3181 N92-27665 #
AD-A246398 ..... p 3043 N92-27750 #
AD-A246399 ..... p 3162 N92-27751 #
AD-A246407 ..... p 3069 N92-27752 #
AD-A246408 ..... p 3069 N92-27819 #
AD-A246428 ..... p 3109 N92-27203 #
AD-A246429 ..... p 3088 N92-27204 #
AD-A246432 ..... p 3159 N92-27205 #
AD-A246444 ..... p 3135 N92-27666 #
AD-A246445 ..... p 3043 N92-27914 #
AD-A246446 ..... p 3135 N92-27820 #
AD-A246447 ..... p 3074 N92-27821 #
AD-A246449 ..... p 3140 N92-27822 #
AD-A246452 ..... p 3135 N92-27667 #
AD-A246458 ..... p 3052 N92-27836 #
AD-A246474 ..... p 3153 N92-27605 #
AD-A246477 ..... p 3148 N92-27606 #
AD-A246478 ..... p 3177 N92-27607 #
AD-A246483 ..... p 3077 N92-27837 #
AD-A246486 ..... p 3048 N92-27206 #
AD-A246488 ..... p 3073 N92-27207 #
AD-A246489 ..... p 3145 N92-27208 #
AD-A246490 ..... p 3126 N92-27209 #
AD-A246492 ..... p 3163 N92-27210 #
AD-A246496 ..... p 3145 N92-27211 #
AD-A246499 ..... p 3129 N92-27668 #
AD-A246507 ..... p 3106 N92-27630 #
AD-A246510 ..... p 3080 N92-27631 #
AD-A246511 ..... p 3177 N92-27632 #
AD-A246524 ..... p 3178 N92-27527 #
AD-A246525 ..... p 3180 N92-27528 #
AD-A246531 ..... p 3101 N92-27529 #
AD-A246553 ..... p 3053 N92-27530 #
AD-A246559 ..... p 3068 N92-27531 #
AD-A246565 ..... p 3179 N92-27499 #
AD-A246572 ..... p 3162 N92-27532 #
AD-A246574 ..... p 3133 N92-27533 #
AD-A246576 ..... p 3054 N92-27534 #
AD-A246586 ..... p 3139 N92-27500 #
AD-A246588 ..... p 3139 N92-27501 #
AD-A246589 ..... p 3132 N92-27502 #
AD-A246592 ..... p 3082 N92-27503 #
AD-A246594 ..... p 3146 N92-27504 #
AD-A246596 ..... p 3050 N92-27505 #
AD-A246611 ..... p 3139 N92-27535 #
AD-A246613 ..... p 3184 N92-27536 #
AD-A246623 ..... p 3140 N92-27537 #
AD-A246625 ..... p 3182 N92-27979 #
AD-A246626 ..... p 3157 N92-27980 #
AD-A246627 ..... p 3183 N92-27981 #
AD-A246633 ..... p 3046 N92-27982 #
AD-A246638 ..... p 3052 N92-27753 #
AD-A246641 ..... p 3182 N92-27754 #
AD-A246644 ..... p 3154 N92-27755 #
AD-A246647 ..... p 3168 N92-27756 #
AD-A246651 ..... p 3104 N92-27757 #
AD-A246653 ..... p 3084 N92-27758 #
AD-A246655 ..... p 3091 N92-27759 #
AD-A246661 ..... p 3114 N92-27760 #
AD-A246662 ..... p 3069 N92-27761 #
AD-A246665 ..... p 3157 N92-27762 #
AD-A246666 ..... p 3160 N92-27915 #
AD-A246716 ..... p 3151 N92-28069 #
AD-A246725 ..... p 3080 N92-28070 #
AD-A246727 ..... p 3087 N92-28103 #
AD-A246728 ..... p 3152 N92-28104 #
AD-A246738 ..... p 3164 N92-28105 #
AD-A246749 ..... p 3152 N92-28106 #
AD-A246751 ..... p 3179 N92-28107 #
AD-A246752 ..... p 3136 N92-28108 #
AD-A246754 ..... p 3087 N92-28129 #
AD-A246802 ..... p 3093 N92-28130 #
AD-A246803 ..... p 3109 N92-28131 #
AD-A246814 ..... p 3044 N92-28132 #
AD-A246818 ..... p 3044 N92-28133 #
AD-A246820 ..... p 3087 N92-28134 #
AD-A246821 ..... p 3142 N92-27350 #
AD-A246836 ..... p 3075 N92-28119 #
AD-A246847 ..... p 3072 N92-28120 #
AD-A246848 ..... p 3093 N92-28121 #
AD-A246849 ..... p 3072 N92-28122 #
AD-A246866 ..... p 3163 N92-27351 #
AD-A246878 ..... p 3182 N92-27824 #
AD-A246882 ..... p 3158 N92-28144 #
AD-A246886 ..... p 3072 N92-28145 #
AD-A246890 ..... p 3126 N92-27380 #
AD-A246893 ..... p 3082 N92-27506 #
AD-A246895 ..... p 3177 N92-27983 #
AD-A246896 ..... p 3150 N92-27984 #
AD-A246899 ..... p 3177 N92-27985 #
AD-A246900 ..... p 3184 N92-27917 #
AD-A246903 ..... p 3168 N92-27716 #
AD-A246904 ..... p 3084 N92-27717 #
AD-A246906 ..... p 3149 N92-27718 #
AD-A246908 ..... p 3045 N92-27719 #
AD-A246909 ..... p 3168 N92-27720 #
AD-A246918 ..... p 3101 N92-27546 #
AD-A246920 ..... p 3133 N92-27507 #
AD-A246928 ..... p 3090 N92-27508 #
AD-A246932 ..... p 3139 N92-27509 #
AD-A246934 ..... p 3143 N92-28071 #
AD-A246937 ..... p 3128 N92-28072 #
AD-A246938 ..... p 3049 N92-28073 #
AD-A246941 ..... p 3111 N92-28074 #
AD-A246953 ..... p 3138 N92-27331 #
AD-A246955 ..... p 3073 N92-27332 #
AD-A246956 ..... p 3145 N92-27333 #
AD-A246958 ..... p 3159 N92-27334 #
AD-A246960 ..... p 3094 N92-27352 #
AD-A246969 ..... p 3082 N92-27400 #
AD-A246989 ..... p 3089 N92-27401 #
AD-A246990 ..... p 3176 N92-27402 #
AD-A246991 ..... p 3176 N92-27381 #
AD-A247000 ..... p 3119 N92-27881 #
AD-A247001 ..... p 3105 N92-27986 #
AD-A247003 ..... p 3157 N92-27987 #
AD-A247004 ..... p 3138 N92-28135 #
AD-A247005 ..... p 3075 N92-28136 #
AD-A247006 ..... p 3093 N92-28137 #
AD-A247009 ..... p 3117 N92-28138 #
AD-A247028 ..... p 3045 N92-27335 #
AD-A247030 ..... p 3128 N92-27336 #
AD-A247032 ..... p 3138 N92-27337 #
AD-A247033 ..... p 3166 N92-27338 #
AD-A247034 ..... p 3082 N92-27339 #
AD-A247036 ..... p 3162 N92-28146 #
AD-A247038 ..... p 3196 N92-28147 #
AD-A247039 ..... p 3151 N92-28075 #
AD-A247040 ..... p 3049 N92-28076 #
AD-A247047 ..... p 3177 N92-28077 #
AD-A247048 ..... p 3140 N92-27825 #
AD-A247051 ..... p 3131 N92-27988 #
AD-A247054 ..... p 3181 N92-27681 #
AD-A247056 ..... p 3105 N92-27918 #
AD-A247096 ..... p 3140 N92-27839 #
AD-A247103 ..... p 3137 N92-27844 #
AD-A247108 ..... p 3091 N92-27840 #
AD-A247134 ..... p 3131 N92-28168 #
AD-A247149 ..... p 3162 N92-27369 #
AD-A247171 ..... p 3105 N92-28175 #
AD-A247173 ..... p 3142 N92-28176 #
AD-A247174 ..... p 3140 N92-27538 #
AD-A247181 ..... p 3130 N92-27696 #
AD-A247195 ..... p 3043 N92-27682 #

AD-A247197 ..... p 3141 N92-28094 #
AD-A247198 ..... p 3141 N92-27989 #
AD-A247202 ..... p 3158 N92-28189 #
AD-A247206 ..... p 3145 N92-27382 #
AD-A247212 ..... p 3194 N92-27841 #
AD-A247216 ..... p 3130 N92-27842 #
AD-A247230 ..... p 3068 N92-27383 #
AD-A247233 ..... p 3115 N92-27213 #
AD-A247247 ..... p 3118 N92-27214 #
AD-A247248 ..... p 3145 N92-27215 #
AD-A247249 ..... p 3153 N92-27212 #
AD-A247253 ..... p 3159 N92-27384 #
AD-A247265 ..... p 3071 N92-27510 #
AD-A247267 ..... p 3150 N92-27919 #
AD-A247287 ..... p 3106 N92-27385 #
AD-A247295 ..... p 3144 N92-28177 #
AD-A247298 ..... p 3143 N92-27990 #
AD-A247322 ..... p 3152 N92-28169 #
AD-A247325 ..... p 3089 N92-27353 #
AD-A247326 ..... p 3107 N92-27354 #
AD-A247338 ..... p 3176 N92-27216 #
AD-A247345 ..... p 3044 N92-27217 #
AD-A247350 ..... p 3082 N92-27386 #
AD-A247435 ..... p 3130 N92-27845 #
AD-A247439 ..... p 3169 N92-27920 #
AD-A247447 ..... p 3181 N92-27590 #
AD-A247448 ..... p 3148 N92-27591 #
AD-A247449 ..... p 3077 N92-27550 #
AD-A247450 ..... p 3077 N92-27592 #
AD-A247452 ..... p 3218 N92-27593 #
AD-A247455 ..... p 3130 N92-27859 #
AD-A247501 ..... p 3127 N92-27922 #
AD-A247554 ..... p 3127 N92-27594 #
AD-A247555 ..... p 3167 N92-27595 #
AD-A247556 ..... p 3167 N92-27596 #
AD-A247557 ..... p 3076 N92-27539 #
AD-A247559 ..... p 3080 N92-27562 #
AD-A247560 ..... p 3172 N92-27563 #
AD-A247561 ..... p 3134 N92-27583 #
AD-A247567 ..... p 3148 N92-27584 #
AD-A247569 ..... p 3083 N92-27564 #
AD-A247570 ..... p 3083 N92-27565 #
AD-A247574 ..... p 3108 N92-27566 #
AD-A247577 ..... p 3090 N92-27567 #
AD-A247588 ..... p 3129 N92-27551 #
AD-A247591 ..... p 3159 N92-27568 #
AD-A247592 ..... p 3147 N92-27569 #
AD-A247616 ..... p 3167 N92-27608 #
AD-A247618 ..... p 3167 N92-27597 #
AD-A247619 ..... p 3176 N92-27598 #
AD-A247628 ..... p 3167 N92-27599 #
AD-A247629 ..... p 3125 N92-27511 #
AD-A247631 ..... p 3180 N92-27552 #
AD-A247636 ..... p 3181 N92-27553 #
AD-A247651 ..... p 3118 N92-27554 #
AD-A247778 ..... p 3077 N92-27704 #
AD-A247780 ..... p 3184 N92-27860 #
AD-A247785 ..... p 3092 N92-27884 #
AD-A247786 ..... p 3091 N92-27861 #
AD-A247787 ..... p 3184 N92-27885 #
AD-A247792 ..... p 3104 N92-27886 #
AD-A247795 ..... p 3177 N92-27705 #
AD-A247799 ..... p 3065 N92-27862 #
AD-A247804 ..... p 3135 N92-27906 #
AD-A247823 ..... p 3141 N92-27910 #
AD-A247825 ..... p 3044 N92-27916 #
AD-A247827 ..... p 3174 N92-27921 #
AD-A247830 ..... p 3140 N92-27863 #
AD-A247831 ..... p 3162 N92-27924 #
AD-A247834 ..... p 3085 N92-27864 #
AD-A247853 ..... p 3146 N92-27387 #
AD-A247855 ..... p 3055 N92-27388 #
AD-A247859 ..... p 3154 N92-27389 #
AD-A247860 ..... p 3139 N92-27512 #
AD-A247871 ..... p 3090 N92-27513 #
AD-A247872 ..... p 3137 N92-27371 #
AD-A247880 ..... p 3071 N92-27514 #
AD-A247910 ..... p 3150 N92-27848 #
AD-A247921 ..... p 3069 N92-27849 #
AD-A247922 ..... p 3116 N92-27850 #
AD-A247924 ..... p 3075 N92-28139 #
AD-A247927 ..... p 3110 N92-27851 #
AD-A247928 ..... p 3125 N92-27846 #
AD-A247929 ..... p 3160 N92-27852 #
AD-A247935 ..... p 3169 N92-27826 #
AD-A247957 ..... p 3091 N92-27847 #
AD-A247999 ..... p 3071 N92-27853 #
AD-A248003 ..... p 3161 N92-27854 #
AD-A248020 ..... p 3116 N92-27865 #
AD-A248161 ..... p 3173 N92-27866 * #
AD-A248164 ..... p 3077 N92-27867 #
AD-A248167 ..... p 3150 N92-27868 #
AD-A248296 ..... p 3091 N92-27869 #
AD-A248326 ..... p 3047 N92-27925 #
AD-A248351 ..... p 3143 N92-27991 #
AD-A248377 ..... p 3085 N92-28003 #
AD-A248378 ..... p 3047 N92-28004 #
AD-A248386 ..... p 3085 N92-28005 #
AD-A248389 ..... p 3151 N92-28006 #
AD-A248393 ..... p 3170 N92-28007 #
AD-A248401 ..... p 3164 N92-28008 #
AD-A248410 ..... p 3072 N92-28009 #
AD-A248411 ..... p 3141 N92-28050 #
AD-A248412 ..... p 3109 N92-28051 #
AD-A248447 ..... p 3078 N92-28148 #
AD-A248453 ..... p 3160 N92-28140 #
AD-A248456 ..... p 3093 N92-28141 #
AD-A248460 ..... p 3142 N92-28142 #
AD-A248461 ..... p 3194 N92-27935 #
AD-A248480 ..... p 3194 N92-28059 #
AD-A248568 ..... p 3046 N92-28123 #
AD-A248572 ..... p 3127 N92-27963 #
AD-A248573 ..... p 3092 N92-27992 #
AD-A248578 ..... p 3142 N92-28170 #
AD-A248582 ..... p 3158 N92-28060 #
AD-A248583 ..... p 3158 N92-28061 #
AD-A248584 ..... p 3117 N92-28178 #
AD-A248585 ..... p 3115 N92-28171 #
AD-A248586 ..... p 3142 N92-28179 #
AD-A248591 ..... p 3081 N92-28180 #
AD-A248594 ..... p 3170 N92-28181 #
AD-A248596 ..... p 3105 N92-28062 #
AD-A248598 ..... p 3160 N92-28182 #
AD-A248602 ..... p 3144 N92-28063 #
AD-A248612 ..... p 3072 N92-28064 #
AD-A248632 ..... p 3085 N92-28065 #
AD-A248637 ..... p 3070 N92-28202 #
AD-A248652 ..... p 3106 N92-27993 #
AD-A248653 ..... p 3055 N92-27994 #
AD-A248657 ..... p 3044 N92-27964 #
AD-A248681 ..... p 3092 N92-27965 #
AD-A248692 ..... p 3135 N92-28010 #
AD-A248693 ..... p 3163 N92-28011 #
AD-A248706 ..... p 3177 N92-28012 #
AD-A248733 ..... p 3109 N92-28124 #
AD-A248735 ..... p 3170 N92-28125 #
AD-A248736 ..... p 3078 N92-28126 #
AD-A248738 ..... p 3077 N92-27966 #
AD-A248741 ..... p 3070 N92-27967 #
AD-A248743 ..... p 3138 N92-27968 #
AD-A248759 ..... p 3150 N92-27995 #
AD-A248760 ..... p 3144 N92-28095 #
AD-A248761 ..... p 3141 N92-27969 #
AD-A248767 ..... p 3219 N92-28127 #
AD-A248768 ..... p 3219 N92-28128 #
AD-A248769 ..... p 3219 N92-28109 #
AD-A248770 ..... p 3219 N92-28110 #
AD-A248771 ..... p 3219 N92-28111 #
AD-A248772 ..... p 3218 N92-28096 #
AD-A248773 ..... p 3218 N92-28097 #
AD-A248774 ..... p 3219 N92-28098 #
AD-A248775 ..... p 3219 N92-28099 #
AD-A248776 ..... p 3218 N92-28078 #
AD-A248883 ..... p 3111 N92-27996 #
AD-A248887 ..... p 3043 N92-28052 #
AD-A248891 ..... p 3085 N92-27970 #
AD-A248894 ..... p 3141 N92-27971 #
AD-A248897 ..... p 3185 N92-27997 #
AD-A248951 ..... p 3085 N92-28086 #
AD-A248952 ..... p 3092 N92-28087 #
AD-A248954 ..... p 3044 N92-28079 #
AD-A248957 ..... p 3092 N92-28080 #
AD-A248958 ..... p 3178 N92-28081 #
AD-A248960 ..... p 3151 N92-28082 #
AD-A249099 ..... p 3074 N92-28053 #
AD-A249120 ..... p 3151 N92-28068 #
AD-A249122 ..... p 3183 N92-28172 #
AD-A249125 ..... p 3183 N92-28083 #
AD-A249142 ..... p 3075 N92-28143 #
AD-A249258 ..... p 3107 N92-28217 #
AD-A249262 ..... p 3178 N92-28218 #
AD-A251966 ..... p 3185 N92-28113 * #
AD-A251967 ..... p 3185 N92-28114 * #
AD-A252057 ..... p 3186 N92-28116 * #
AD-D015194 ..... p 3076 N92-27491
AD-D015195 ..... p 3080 N92-27492
AD-D015201 ..... p 3106 N92-27823 #
AD-D015206 ..... p 3089 N92-27398
AD-D015208 ..... p 3089 N92-27445
AD-D015210 ..... p 3169 N92-27838
AD-D015213 ..... p 3083 N92-27615
AD-D015217 ..... p 3168 N92-27616
AD-D015220 ..... p 3108 N92-27617
AD-D015221 ..... p 3077 N92-27618
AD-D015222 ..... p 3074 N92-27619
AD-D015223 ..... p 3163 N92-27998
AD-D015224 ..... p 3169 N92-27999
AD-D015225 ..... p 3092 N92-28000
AD-D015226 ..... p 3170 N92-28001
AD-D015228 ..... p 3046 N92-28002
AD-D015239 ..... p 3067 N92-27627
AD-D015240 ..... p 3054 N92-27628
AD-D015241 ..... p 3110 N92-27629
AD-D015244 ..... p 3143 N92-27372
AD-D015246 ..... p 3166 N92-27373
AD-D015247 ..... p 3054 N92-27374
AD-E040166 ..... p 3134 N92-27575 #
AD-E040168 ..... p 3134 N92-27574 #
AD-E040178 ..... p 3134 N92-27604 #
AD-E040219 ..... p 3145 N92-27382 #
AD-E040221 ..... p 3131 N92-28168 #
AD-E040222 ..... p 3127 N92-27922 #
AD-E040224 ..... p 3169 N92-27920 #
AD-E200838 ..... p 3080 N92-28070 #
AD-E200854 ..... p 3126 N92-27380 #
AD-E200867 ..... p 3082 N92-27506 #
AD-E200874 ..... p 3087 N92-28103 #
AD-E200886 ..... p 3130 N92-27845 #
AD-E200902 ..... p 3127 N92-27594 #
AD-E200919 ..... p 3085 N92-28003 #
AD-E200939 ..... p 3106 N92-27993 #
AD-E200941 ..... p 3047 N92-28004 #
AD-E951748 ..... p 3177 N92-27607 #
AD-E951749 ..... p 3148 N92-27606 #
AFIT/EN-TR-91-10 ..... p 3146 N92-27436 #
AFIT/GCS/ENG/92M-01 ..... p 3150 N92-27868 #
AFIT/GLM/ENS/91S-50 ..... p 3045 N92-27719 #
AFIT/GLM/LSM/91S-11 ..... p 3157 N92-27980 #
AFIT/GLM/LSM/91S-34 ..... p 3183 N92-27981 #
AFIT/GLM/LSM/91S-44 ..... p 3140 N92-27537 #
AFIT/GLM/LSR/91S-24 ..... p 3152 N92-28104 #
AFIT/GSM/LSG/91S-6 ..... p 3114 N92-27760 #
AFIT/GSM/LSR/91S-3 ..... p 3182 N92-27754 #
AFIT/GSM/LSY/91S-5 ..... p 3182 N92-27979 #
AFIT/GSS/ENG/91D-3 ..... p 3044 N92-28132 #
AFIT/GSS/ENG/91D-9 ..... p 3151 N92-28069 #
AFIT/GSS/LSM/91D-5 ..... p 3182 N92-27824 #
AFIT/GSS/LSY/91D-4 ..... p 3152 N92-28106 #
AFOSR-02-0010TR ..... p 3157 N92-27987 #
AFOSR-92-0005TR ..... p 3106 N92-27385 #
AFOSR-92-0006TR ..... p 3107 N92-27354 #
AFOSR-92-0013TR ..... p 3168 N92-27716 #
AFOSR-92-0015TR ..... p 3105 N92-27918 #
AFOSR-92-0019TR ..... p 3130 N92-27696 #
AFOSR-92-0020TR ..... p 3093 N92-28137 #
AFOSR-92-0022TR ..... p 3105 N92-27986 #
AFOSR-92-0072TR ..... p 3065 N92-27862 #
AFOSR-92-0073TR ..... p 3071 N92-27510 #
AFOSR-92-0075TR ..... p 3142 N92-28176 #
AFOSR-92-0078TR ..... p 3194 N92-27841 #
AFOSR-92-0082TR ..... p 3128 N92-27336 #
AFOSR-92-0088TR ..... p 3094 N92-27352 #
AFOSR-92-0100TR ..... p 3101 N92-27546 #
AFOSR-92-0103TR ..... p 3138 N92-27337 #
AFOSR-92-0106TR ..... p 3196 N92-28147 #
AFOSR-92-0109TR ..... p 3140 N92-27839 #
AFOSR-92-0110TR ..... p 3137 N92-27844 #
AFOSR-92-0112TR ..... p 3139 N92-27512 #
AFOSR-92-0120TR ..... p 3117 N92-28138 #
AFOSR-92-0121TR ..... p 3072 N92-28145 #
AFOSR-92-0125TR ..... p 3131 N92-27988 #
AFOSR-92-0131TR ..... p 3138 N92-27331 #
AFOSR-92-0134TR ..... p 3138 N92-28135 #
AFOSR-92-0135TR ..... p 3140 N92-27825 #
AFOSR-92-0138TR ..... p 3071 N92-27853 #
AFOSR-92-0139TR ..... p 3141 N92-27989 #
AFOSR-92-0141TR ..... p 3141 N92-28094 #
AFOSR-92-0155TR ..... p 3158 N92-28189 #
AFOSR-92-0156TR ..... p 3159 N92-27334 #
AFOSR-92-0157TR ..... p 3151 N92-28075 #
AFOSR-92-0163TR ..... p 3049 N92-28076 #
AFOSR-92-0164TR ..... p 3105 N92-28175 #
AFOSR-92-0171TR-VOL-5A ..... p 3219 N92-28127 #
AFOSR-92-0172TR-VOL-5B ..... p 3219 N92-28128 #
AFOSR-92-0173TR-VOL-6 ..... p 3219 N92-28109 #
AFOSR-92-0174TR-VOL-7 ..... p 3219 N92-28110 #
AFOSR-92-0175TR-VOL-8 ..... p 3219 N92-28111 #
AFOSR-92-0176TR-VOL-9 ..... p 3218 N92-28096 #
AFOSR-92-0177TR-VOL-10 ..... p 3218 N92-28097 #
AFOSR-92-0178TR-VOL-11 ..... p 3219 N92-28098 #
AFOSR-92-0179TR-VOL-12 ..... p 3219 N92-28099 #
AFOSR-92-0180TR-VOL-13 ..... p 3218 N92-28078 #
AFOSR-92-0193TR ..... p 3194 N92-27935 #
AFOSR-92-0197TR ..... p 3109 N92-28051 #

AFOSR-92-0204TR ..... p 3141 N92-28050 #
AFOSR-92-0214TR ..... p 3105 N92-28062 #
AFOSR-92-0225TR ..... p 3158 N92-28060 #
AFOSR-92-0226TR ..... p 3158 N92-28061 #
AFOSR-92-0230TR ..... p 3127 N92-27963 #
AFOSR-92-0257TR ..... p 3115 N92-28171 #
AFOSR-92-0260TR ..... p 3142 N92-28179 #
AFOSR-92-0264 ..... p 3138 N92-27968 #
AFOSR-92-0265TR ..... p 3142 N92-28170 #

AGARD-AR-311 ..... p 3046 N92-27870 #

AGARD-CP-504 ..... p 3031 N92-27887 #
AGARD-CP-507 ..... p 3037 N92-27936 #
AGARD-CP-510 ..... p 3094 N92-27450 #

AGARD-LS-184 ..... p 3086 N92-28084 #

AGARD-R-786 ..... p 3036 N92-27706 #
AGARD-R-787 ..... p 3102 N92-27671 #

AIAA-PAPER-92-2264 ..... p 3115 N92-27375 * #
AIAA-PAPER-92-4106 ..... p 3048 N92-27379 * #

AIAA-92-3082 ..... p 3102 N92-27653 * #
AIAA-92-3090 ..... p 3049 N92-27652 * #
AIAA-92-3098 ..... p 3042 N92-28102 * #
AIAA-92-3445 ..... p 3067 N92-27654 * #
AIAA-92-3789 ..... p 3049 N92-27669 * #
AIAA-92-3861 ..... p 3157 N92-27517 * #

AL-TP-1992-0002 ..... p 3144 N92-28177 #

AL-TR-1991-0082 ..... p 3143 N92-28071 #
AL-TR-1991-0119 ..... p 3141 N92-27910 #
AL-TR-1991-0121 ..... p 3044 N92-27916 #
AL-TR-1991-0134 ..... p 3140 N92-27863 #

AL-18 ..... p 3052 N92-27836 #

AMSMI/TR-RD-BA-91-1 ..... p 3148 N92-27606 #

AMSMI/TR-RD-SS-91-10 ..... p 3177 N92-27607 #

AMTL-FR-12.91-PHASE-1 ..... p 3069 N92-27827 #

ANL/CP-73835 ..... p 3123 N92-27392 #
ANL/CP-74100 ..... p 3073 N92-27346 #
ANL/CP-74708 ..... p 3161 N92-27411 #
ANL/CP-75540 ..... p 3176 N92-27345 #
ANL/CP-75645 ..... p 3125 N92-27571 #
ANL/CP-75656 ..... p 3076 N92-27412 #
ANL/CP-75676 ..... p 3110 N92-27410 #
ANL/CP-75687 ..... p 3176 N92-27409 #

ANL/HEP/CP-91-113 ..... p 3195 N92-27390 #

ANL/RP-75587 ..... p 3125 N92-28056 #

APL-UW-TR-9204 ..... p 3125 N92-27846 #

ARB-R-92/484 ..... p 3072 N92-28207 #

ARCCB-CR-92001 ..... p 3115 N92-27213 #

ARCCB-MR-92008 ..... p 3075 N92-28143 #

ARI-RN-92-18 ..... p 3141 N92-27971 #
ARI-RN-92-90 ..... p 3141 N92-27969 #

ARL-STRUC-TM-538 ..... p 3046 N92-28118 #
ARL-STRUC-TM-579 ..... p 3159 N92-27205 #

ARO-24087.2-EL ..... p 3178 N92-28218 #
ARO-25286-CH ..... p 3076 N92-27442 #
ARO-26988.1-GS ..... p 3085 N92-27970 #
ARO-28809.3-MA-SDI ..... p 3160 N92-28182 #

ASIAC-TR-91-1 ..... p 3116 N92-27865 #

ASL-91-2 ..... p 3047 N92-27424 * #

AVSCOM-TR-91-C-049 ..... p 3111 N92-27879 * #

AWS/TN-91/001 ..... p 3129 N92-27551 #

B-247885 ..... p 3182 N92-27928 #

BARC-1549 ..... p 3183 N92-27496 #
BARC-1551 ..... p 3078 N92-28159 #
BARC-1991/E/010 ..... p 3184 N92-27497 #

BBC-RD-1992/1 ..... p 3087 N92-28100
BBC-RD-1992/2 ..... p 3087 N92-28101

BFLRF-275 ..... p 3110 N92-27851 #

BNL-46407 ..... p 3074 N92-27913 #

BONN-IR-91-13 ..... p 3163 N92-27421 #
BONN-IR-91-15 ..... p 3128 N92-27420 #

BRL-TR-3307 ..... p 3158 N92-27834 #
BRL-TR-3315 ..... p 3157 N92-27762 #

CASS-GR-013 ..... p 3130 N92-27696 #

CDNSWC-SME-92-08 ..... p 3078 N92-28126 #

CERC-WIS-25 ..... p 3135 N92-27820 #

CGCR-89-7 ..... p 3124 N92-27426 #
CGCR-89-9 ..... p 3124 N92-27359 #
CGCR-90-10 ..... p 3133 N92-27548 #
CGCR-90-12 ..... p 3132 N92-27357 #
CGCR-90-17 ..... p 3128 N92-27425 #
CGCR-90-4 ..... p 3133 N92-27549 #
CGCR-91-10 ..... p 3125 N92-27641 #
CGCR-91-12 ..... p 3136 N92-28199 #
CGCR-91-14 ..... p 3129 N92-27427 #
CGCR-91-17 ..... p 3133 N92-27547 #
CGCR-91-1 ..... p 3131 N92-27340 #
CGCR-91-22 ..... p 3132 N92-27370 #
CGCR-91-3 ..... p 3131 N92-27341 #
CGCR-91-5 ..... p 3132 N92-27342 #
CGCR-91-6 ..... p 3132 N92-27356 #
CGCR-91-9 ..... p 3125 N92-28200 #

CMS-TSR-92-10 ..... p 3117 N92-28178 #

CMU-RI-TR-92-02 ..... p 3173 N92-27866 * #

CN-ONR-1 ..... p 3139 N92-27509 #

COE/DC-TR-REMR-EM-7 ..... p 3076 N92-27539 #

COINS-TR-88-02 ..... p 3151 N92-28068 #

CONF-890594-6 ..... p 3166 N92-27413 #
CONF-8908169-1 ..... p 3136 N92-27349 #
CONF-9011279-1 ..... p 3076 N92-27412 #
CONF-9107201-1 ..... p 3161 N92-27348 #
CONF-9108141-3 ..... p 3195 N92-27390 #
CONF-910920-28 ..... p 3079 N92-27363 #
CONF-9109230-14 ..... p 3166 N92-27365 #
CONF-9110352-1 ..... p 3075 N92-27364 #
CONF-9111111-40 ..... p 3073 N92-27346 #
CONF-9111182-4 ..... p 3179 N92-28160 #
CONF-911202-66 ..... p 3074 N92-27913 #
CONF-920144-5 ..... p 3069 N92-27856 #
CONF-920172-4 ..... p 3154 N92-27368 #
CONF-920172-5 ..... p 3146 N92-27414 #
CONF-920198-1 ..... p 3125 N92-27571 #
CONF-920199-1 ..... p 3176 N92-27345 #
CONF-920266 ..... p 3166 N92-28045 #
CONF-920296-1 ..... p 3118 N92-28214 #
CONF-9203110-2 ..... p 3176 N92-27409 #
CONF-920315-8 ..... p 3166 N92-28174 #
CONF-920408-1 ..... p 3161 N92-27411 #
CONF-9204106-1 ..... p 3146 N92-27391 #
CONF-9204106-2 ..... p 3154 N92-28173 #
CONF-920439-3 ..... p 3171 N92-27362 #
CONF-920439-4 ..... p 3110 N92-27410 #
CONF-9205127-1 ..... p 3107 N92-28054 #
CONF-9205129-1 ..... p 3123 N92-27392 #
CONF-9206101-2 ..... p 3154 N92-27748 #
CONF-920631-13 ..... p 3117 N92-28041 #

CRG-89-4 ..... p 3124 N92-27343 #
CRG-89-5-PT-1 ..... p 3126 N92-27355 #
CRG-89-6-PT-2 ..... p 3128 N92-28201 #

CRREL-SR-91-21 ..... p 3115 N92-27573 #

CRSE-91-02 ..... p 3158 N92-28144 #

CSC/TM-88/6001 ..... p 3158 N92-28210 * #

CSDL-T-1106 ..... p 3051 N92-28209 * #

CSS-TM-567-91 ..... p 3106 N92-27857 #

CTN-92-60451 ..... p 3116 N92-27633 #
CTN-92-60452 ..... p 3103 N92-27683 #
CTN-92-60453 ..... p 3149 N92-27697 #
CTN-92-60454 ..... p 3071 N92-27634 #
CTN-92-60455 ..... p 3161 N92-27638 #
CTN-92-60456 ..... p 3090 N92-27639 #
CTN-92-60457 ..... p 3127 N92-27620 #
CTN-92-60458 ..... p 3125 N92-27641 #
CTN-92-60459 ..... p 3129 N92-27610 #
CTN-92-60461 ..... p 3134 N92-27621 #
CTN-92-60462 ..... p 3129 N92-27622 #
CTN-92-60463 ..... p 3127 N92-27642 #
CTN-92-60464 ..... p 3190 N92-27623 #
CTN-92-60465 ..... p 3189 N92-27644 #
CTN-92-60466 ..... p 3190 N92-27611 #
CTN-92-60467 ..... p 3056 N92-27612 #
CTN-92-60468 ..... p 3051 N92-27645 #
CTN-92-60469 ..... p 3117 N92-28158 #
CTN-92-60470 ..... p 3056 N92-27646 #
CTN-92-60471 ..... p 3036 N92-27624 #
CTN-92-60472 ..... p 3056 N92-27613 #
CTN-92-60473 ..... p 3108 N92-27647 #
CTN-92-60474 ..... p 3173 N92-27648 #
CTN-92-60475 ..... p 3168 N92-27625 #
CTN-92-60476 ..... p 3109 N92-27698 #
CTN-92-60477 ..... p 3189 N92-27684 #
CTN-92-60478 ..... p 3195 N92-27685 #
CTN-92-60479 ..... p 3189 N92-27686 #
CTN-92-60480 ..... p 3190 N92-27687 #
CTN-92-60481 ..... p 3191 N92-27699 #
CTN-92-60482 ..... p 3179 N92-27688 #
CTN-92-60483 ..... p 3191 N92-27689 #
CTN-92-60484 ..... p 3189 N92-27700 #
CTN-92-60485 ..... p 3191 N92-27701 #
CTN-92-60486 ..... p 3191 N92-27690 #
CTN-92-60487 ..... p 3164 N92-27691 #
CTN-92-60488 ..... p 3068 N92-27650 #
CTN-92-60489 ..... p 3081 N92-27692 #
CTN-92-60490 ..... p 3068 N92-27614 #
CTN-92-60492 ..... p 3104 N92-27693 #
CTN-92-60493 ..... p 3071 N92-27694 #
CTN-92-60494 ..... p 3137 N92-27702 #
CTN-92-60495 ..... p 3181 N92-27703 #
CTN-92-60496 ..... p 3084 N92-27695 #
CTN-92-60499 ..... p 3171 N92-27446 #
CTN-92-60501 ..... p 3172 N92-27447 #
CTN-92-60502 ..... p 3174 N92-28193 #
CTN-92-60503 ..... p 3172 N92-27579 #
CTN-92-60505 ..... p 3172 N92-27580 #
CTN-92-60506 ..... p 3173 N92-27581 #
CTN-92-60507 ..... p 3172 N92-27448 #
CTN-92-60508 ..... p 3174 N92-28194 #
CTN-92-60509 ..... p 3174 N92-28195 #
CTN-92-60510 ..... p 3175 N92-28204 #
CTN-92-60511 ..... p 3175 N92-28205 #
CTN-92-60512 ..... p 3175 N92-28196 #
CTN-92-60514 ..... p 3172 N92-27449 #
CTN-92-60515 ..... p 3175 N92-28197 #
CTN-92-60516 ..... p 3175 N92-28198 #
CTN-92-60517 ..... p 3173 N92-27882 #
CTN-92-60518 ..... p 3173 N92-27582 #
CTN-92-60519 ..... p 3173 N92-27883 #
CTN-92-60520 ..... p 3133 N92-27547 #
CTN-92-60521 ..... p 3133 N92-27548 #
CTN-92-60522 ..... p 3133 N92-27549 #
CTN-92-60523 ..... p 3131 N92-27340 #
CTN-92-60524 ..... p 3131 N92-27341 #
CTN-92-60525 ..... p 3132 N92-27370 #
CTN-92-60526 ..... p 3128 N92-27425 #
CTN-92-60527 ..... p 3124 N92-27426 #
CTN-92-60528 ..... p 3129 N92-27427 #
CTN-92-60529 ..... p 3136 N92-28199 #
CTN-92-60530 ..... p 3125 N92-28200 #
CTN-92-60531 ..... p 3128 N92-28201 #
CTN-92-60532 ..... p 3126 N92-27355 #
CTN-92-60533 ..... p 3132 N92-27356 #
CTN-92-60534 ..... p 3132 N92-27357 #
CTN-92-60535 ..... p 3132 N92-27342 #
CTN-92-60536 ..... p 3124 N92-27343 #
CTN-92-60537 ..... p 3035 N92-27344 #
CTN-92-60539 ..... p 3143 N92-27358 #
CTN-92-60540 ..... p 3124 N92-27359 #

DE92-006739 ..... p 3154 N92-27748 #
DE92-009373 ..... p 3074 N92-27913 #
DE92-009386 ..... p 3171 N92-27362 #
DE92-009408 ..... p 3117 N92-28041 #
DE92-010061 ..... p 3079 N92-27363 #
DE92-010120 ..... p 3075 N92-27364 #
DE92-010252 ..... p 3176 N92-27345 #
DE92-010253 ..... p 3073 N92-27346 #
DE92-010280 ..... p 3125 N92-27571 #
DE92-010292 ..... p 3154 N92-28173 #
DE92-010350 ..... p 3195 N92-27390 #
DE92-010381 ..... p 3188 N92-28042 #
DE92-010401 ..... p 3146 N92-27391 #
DE92-010441 ..... p 3166 N92-27365 #
DE92-010445 ..... p 3089 N92-27366 #
DE92-010446 ..... p 3145 N92-27367 #
DE92-010449 ..... p 3069 N92-27856 #
DE92-010467 ..... p 3126 N92-27347 #
DE92-010476 ..... p 3161 N92-27348 #
DE92-010477 ..... p 3136 N92-27349 #
DE92-010499 ..... p 3176 N92-27409 #
DE92-010500 ..... p 3110 N92-27410 #
DE92-010502 ..... p 3161 N92-27411 #
DE92-010508 ..... p 3076 N92-27412 #

DE92-010515 ..... p 3123 N92-27392 #
DE92-010609 ..... p 3107 N92-27393 #
DE92-010622 ..... p 3109 N92-27394 #
DE92-010630 ..... p 3089 N92-27395 #
DE92-010651 ..... p 3163 N92-27396 #
DE92-010727 ..... p 3147 N92-27570 #
DE92-010742 ..... p 3179 N92-28160 #
DE92-010743 ..... p 3166 N92-27413 #
DE92-010744 ..... p 3146 N92-27414 #
DE92-010745 ..... p 3154 N92-27368 #
DE92-010748 ..... p 3166 N92-28174 #
DE92-010827 ..... p 3107 N92-28054 #
DE92-010850 ..... p 3115 N92-28055 #
DE92-010868 ..... p 3125 N92-28056 #
DE92-011021 ..... p 3194 N92-27415 #
DE92-011058 ..... p 3074 N92-27416 #
DE92-011072 ..... p 3124 N92-27417 #
DE92-011074 ..... p 3080 N92-27418 #
DE92-011076 ..... p 3167 N92-27419 #
DE92-011077 ..... p 3166 N92-28045 #
DE92-011131 ..... p 3174 N92-28057 #
DE92-011189 ..... p 3072 N92-28046 #
DE92-011219 ..... p 3164 N92-28047 #
DE92-011220 ..... p 3072 N92-28043 #
DE92-011263 ..... p 3118 N92-28214 #
DE92-011375 ..... p 3151 N92-28048 #
DE92-619932 ..... p 3074 N92-27875 #
DE92-620035 ..... p 3078 N92-28159 #
DE92-620916 ..... p 3195 N92-27493 #
DE92-620924 ..... p 3195 N92-27494 #
DE92-620935 ..... p 3195 N92-27495 #
DE92-621016 ..... p 3183 N92-27496 #
DE92-621018 ..... p 3184 N92-27497 #
DE92-621061 ..... p 3164 N92-27498 #
DE92-621531 ..... p 3174 N92-28044 #
DE92-622381 ..... p 3179 N92-28215 #
DE92-622860 ..... p 3106 N92-28216 #

DMA-TM-8358.1 ..... p 3118 N92-27554 #

DNA-TR-90-209 ..... p 3071 N92-27835 #

DODA-AR-006-620 ..... p 3046 N92-28118 #
DODA-AR-006-654 ..... p 3159 N92-27205 #

DOE/ER-0538T ..... p 3188 N92-28042 #
DOE/ER-12821/T1 ..... p 3107 N92-27393 #
DOE/ER-13500/3 ..... p 3163 N92-27396 #
DOE/ER-13847/3 ..... p 3072 N92-28043 #
DOE/ER-13864/T1 ..... p 3072 N92-28046 #
DOE/ER-30148/T1 ..... p 3109 N92-27394 #
DOE/ER-40479/T1 ..... p 3194 N92-27415 #
DOE/ER-45360/T4 ..... p 3074 N92-27416 #
DOE/ER-53285/2 ..... p 3174 N92-28057 #

DOT/FAA/AM-92/13 ..... p 3183 N92-28083 #
DOT/FAA/AM-92/3 ..... p 3043 N92-27914 #
DOT/FAA/AM-92/6 ..... p 3139 N92-27500 #
DOT/FAA/AM-92/9 ..... p 3139 N92-27501 #

DOT/FAA/CT-91/19 ..... p 3047 N92-27973 #

DOT/FAA/RD-91/1 ..... p 3043 N92-28052 #
DOT/FAA/RD-92/5 ..... p 3180 N92-27518 #

DREA-91-302 ..... p 3149 N92-27697 #

DREO-CR-91-546 ..... p 3137 N92-27702 #

DREO-TN-91-10 ..... p 3084 N92-27695 #
DREO-TN-91-16 ..... p 3085 N92-27858 #
DREO-TN-91-24 ..... p 3144 N92-28166 #
DREO-TN-91-26 ..... p 3194 N92-27818 #
DREO-TN-9122 ..... p 3143 N92-27664 #

DREO-1095 ..... p 3148 N92-27663 #
DREO-1114 ..... p 3090 N92-27662 #

DREV-4653/91 ..... p 3157 N92-27437 #

DRIC-BR-309631 ..... p 3085 N92-28005 #

DTRC-SME-92-11 ..... p 3077 N92-27966 #

DTRC/SD-92/09 ..... p 3145 N92-27208 #

DTRC/SME-92-09 ..... p 3177 N92-28012 #

E-6826 ..... p 3111 N92-27879 * #
E-6828 ..... p 3035 N92-27376 * #
E-6935 ..... p 3076 N92-27378 * #
E-6962 ..... p 3035 N92-27377 * #
E-7065 ..... p 3102 N92-27653 * #
E-7069 ..... p 3067 N92-27878 * #
E-7082 ..... p 3049 N92-27652 * #
E-7085 ..... p 3049 N92-27669 * #
E-7089 ..... p 3157 N92-27517 * #
E-7116 ..... p 3042 N92-28102 * #
E-7146 ..... p 3067 N92-27654 * #

EFI-1274-60-90 ..... p 3195 N92-27493 #
EFI-1286-72-90 ..... p 3195 N92-27494 #

EGG-EE-9965 ..... p 3115 N92-28055 #

EOARD-TR-92-06 ..... p 3072 N92-28064 #

EPA/600/A-92/069 ..... p 3125 N92-28206 #
EPA/600/R-92/058 ..... p 3125 N92-28208 #

ERC-R-92-022 ..... p 3066 N92-27403 * #

ERP-1082-VOL-2 ..... p 3085 N92-28003 #
ERP-1088 ..... p 3082 N92-27506 #

ESD-TR-91-104 ..... p 3160 N92-27915 #
ESD-TR-91-153 ..... p 3176 N92-27216 #
ESD-TR-91-224 ..... p 3085 N92-27864 #
ESD-TR-91-267 ..... p 3185 N92-27997 #

ESM91-1.0-MECH ..... p 3077 N92-27550 #
ESM91-2.0-MECH ..... p 3077 N92-27592 #

ETN-92-90827 ..... p 3195 N92-27405 #
ETN-92-90828 ..... p 3159 N92-27406 #
ETN-92-90829 ..... p 3094 N92-27407 #
ETN-92-90832 ..... p 3118 N92-27408 #
ETN-92-90833 ..... p 3128 N92-27420 #
ETN-92-90834 ..... p 3163 N92-27421 #
ETN-92-90845 ..... p 3048 N92-27422 #
ETN-92-98030 ..... p 3080 N92-27927 #
ETN-92-98849 ..... p 3081 N92-27926 #

FEL-91-A159 ..... p 3108 N92-27443 #

FFP-3-91 ..... p 3174 N92-28193 #

FIA-91-31 ..... p 3189 N92-27651 * #

FMI/JRL-92/001 ..... p 3069 N92-27761 #

FR-10106 ..... p 3169 N92-27826 #

FTD-ID(RS)T-0695-91 ..... p 3175 N92-27201 #
FTD-ID(RS)T-1472-90 ..... p 3160 N92-27658 #
FTD-ID(RS)T-1475-90 ..... p 3108 N92-27657 #

GAO/NSIAD-92-171BR ..... p 3182 N92-27928 #

GRI-91/0382 ..... p 3081 N92-27715 #

H-1811 ..... p 3048 N92-27587 * #
H-1817 ..... p 3048 N92-27379 * #

IAEA-CN-53-I-2-1 ..... p 3173 N92-27883 #

IAR-AN-74 ..... p 3035 N92-27344 #

IC-91/375 ..... p 3106 N92-28216 #
IC-91/42 ..... p 3179 N92-28215 #

IFT-P-002/91 ..... p 3164 N92-27498 #

IHES/M/91/80 ..... p 3158 N92-27909 #

IME-CFE-TR-001 ..... p 3104 N92-27693 #

INIS-BR-2917 ..... p 3074 N92-27875 #

INO-TM-6 ..... p 3134 N92-27604 #

ISBN-0-16-035949-X ..... p 3182 N92-27843 * #
ISBN-0-309-04629-7 ..... p 3160 N92-27423 #
ISBN-0-315-47774-1 ..... p 3190 N92-27611 #
ISBN-0-315-49255-4 ..... p 3168 N92-27625 #
ISBN-0-315-49569-3 ..... p 3109 N92-27698 #
ISBN-0-315-50129-4 ..... p 3164 N92-27691 #
ISBN-0-315-51095-1 ..... p 3036 N92-27624 #
ISBN-0-315-53743-4 ..... p 3189 N92-27686 #
ISBN-0-315-54644-1 ..... p 3129 N92-27610 #
ISBN-0-315-54650-6 ..... p 3056 N92-27613 #
ISBN-0-315-54662-X ..... p 3191 N92-27690 #
ISBN-0-315-54703-0 ..... p 3189 N92-27644 #
ISBN-0-315-55186-0 ..... p 3129 N92-27622 #
ISBN-0-315-55826-1 ..... p 3190 N92-27623 #
ISBN-0-315-56001-0 ..... p 3056 N92-27646 #
ISBN-0-315-56167-X ..... p 3134 N92-27621 #
ISBN-0-315-56216-1 ..... p 3161 N92-27638 #
ISBN-0-315-56913-1 ..... p 3195 N92-27685 #
ISBN-0-315-56945-X ..... p 3189 N92-27684 #
ISBN-0-315-56953-0 ..... p 3056 N92-27612 #
ISBN-0-315-57198-5 ..... p 3127 N92-27642 #
ISBN-0-315-57927-7 ..... p 3127 N92-27620 #
ISBN-0-315-57980-3 ..... p 3090 N92-27639 #
ISBN-0-315-58085-2 ..... p 3108 N92-27647 #
ISBN-0-315-59910-3 ..... p 3190 N92-27687 #
ISBN-0-315-59931-6 ..... p 3117 N92-28158 #
ISBN-0-315-59945-6 ..... p 3051 N92-27645 #
ISBN-0-315-60751-3 ..... p 3179 N92-27688 #
ISBN-0-315-60772-6 ..... p 3191 N92-27689 #
ISBN-0-315-61537-0 ..... p 3189 N92-27700 #
ISBN-0-315-61539-7 ..... p 3191 N92-27701 #
ISBN-0-315-61634-2 ..... p 3191 N92-27699 #
ISBN-92-835-0659-6 ..... p 3094 N92-27450 #
ISBN-92-835-0660-X ..... p 3037 N92-27936 #
ISBN-92-835-0661-8 ..... p 3036 N92-27706 #
ISBN-92-835-0662-6 ..... p 3031 N92-27887 #
ISBN-92-835-0665-0 ..... p 3046 N92-27870 #
ISBN-92-835-0671-5 ..... p 3102 N92-27671 #
ISBN-92-835-0673-1 ..... p 3086 N92-28084 #

ISL-CO-215/89 ..... p 3080 N92-27927 #

ISSN-0082-5255 ..... p 3116 N92-27633 #
ISSN-0082-5263 ..... p 3103 N92-27683 #
ISSN-0172-8741 ..... p 3128 N92-27420 #
ISSN-0172-8741 ..... p 3163 N92-27421 #
ISSN-0389-4010 ..... p 3067 N92-27430 #
ISSN-0389-4010 ..... p 3110 N92-27431 #
ISSN-0389-4010 ..... p 3110 N92-27432 #
ISSN-0389-4010 ..... p 3046 N92-28153 #
ISSN-0389-4010 ..... p 3051 N92-28154 #
ISSN-0389-4010 ..... p 3047 N92-28191 #
ISSN-0389-4010 ..... p 3043 N92-28192 #
ISSN-0452-2982 ..... p 3051 N92-27428 #
ISSN-0452-2982 ..... p 3045 N92-27429 #
ISSN-0452-2982 ..... p 3042 N92-28151 #
ISSN-0452-2982 ..... p 3042 N92-28152 #
ISSN-0552-2982 ..... p 3042 N92-28190 #
ISSN-0959-0846 ..... p 3187 N92-28220 * #

ISU-ERI-AMES-92114 ..... p 3048 N92-27519 * #

ITP-91-31 ..... p 3174 N92-28044 #

IZF-1991-B-12 ..... p 3137 N92-27361 #
IZF-1991-B-15 ..... p 3138 N92-27444 #

JC-2091-GT-F3 ..... p 3084 N92-27855 #

JPL-PUBL-91-30 ..... p 3119 N92-28013 * #

JPRS-USP-92-001 ..... p 3053 N92-27931 #

JSR-91-300 ..... p 3125 N92-27511 #
JSR-91-330A ..... p 3055 N92-27388 #

JTN-92-80364 ..... p 3051 N92-27428 #
JTN-92-80375 ..... p 3045 N92-27429 #
JTN-92-80376 ..... p 3042 N92-28190 #
JTN-92-80377 ..... p 3042 N92-28151 #
JTN-92-80378 ..... p 3042 N92-28152 #
JTN-92-80379 ..... p 3046 N92-28153 #
JTN-92-80380 ..... p 3051 N92-28154 #
JTN-92-80382 ..... p 3047 N92-28191 #
JTN-92-80383 ..... p 3043 N92-28192 #
JTN-92-80384 ..... p 3067 N92-27430 #
JTN-92-80385 ..... p 3110 N92-27431 #
JTN-92-80386 ..... p 3110 N92-27432 #

L-16838 ..... p 3051 N92-27670 * #
L-17015 ..... p 3153 N92-27589 * #
L-17092-PT-1 ..... p 3056 N92-27721 * #
L-17092-PT-2 ..... p 3061 N92-27788 * #

LA-UR-92-829 ..... p 3118 N92-28214 #

LBL-27728-REV ..... p 3136 N92-27349 #
LBL-31432 ..... p 3161 N92-27348 #
LBL-31674 ..... p 3126 N92-27347 #
LBL-31877 ..... p 3164 N92-28047 #

LMI-DL001-01R1 ..... p 3184 N92-27536 #

LMI-PL105R1 ..... p 3110 N92-27439 #

LTR91-018 ..... p 3106 N92-27385 #

M-689 ..... p 3159 N92-27588 * #

MCAT-92-012 ..... p 3052 N92-27976 * #

MIT/OSP-99328 ..... p 3074 N92-27542 * #

MITT-90-01 ..... p 3094 N92-27407 #

MT-CWR-092-013 ..... p 3075 N92-28136 #

MTL-TR-91-38 ..... p 3169 N92-27826 #
MTL-TR-91-49-PHASE-1 ..... p 3069 N92-27827 #
MTL-TR-91-54 ..... p 3069 N92-27752 #
MTL-TR-92-3 ..... p 3070 N92-27967 #
MTL-TR-92-7 ..... p 3069 N92-27819 #

MTR-11135 ..... p 3085 N92-27864 #
MTR-11194 ..... p 3185 N92-27997 #

NADC-91062-60 ..... p 3068 N92-27383 #
NADC-91079-60 ..... p 3137 N92-27371 #

NAL-TM-637 ..... p 3045 N92-27429 #
NAL-TM-638 ..... p 3051 N92-27428 #
NAL-TM-639 ..... p 3042 N92-28190 #
NAL-TM-640T ..... p 3042 N92-28151 #
NAL-TM-641 ..... p 3042 N92-28152 #

NAL-TR-1102 ..... p 3046 N92-28153 #
NAL-TR-1103 ..... p 3051 N92-28154 #
NAL-TR-1113 ..... p 3047 N92-28191 #
NAL-TR-1115-PT-1 ..... p 3043 N92-28192 #
NAL-TR-1117 ..... p 3067 N92-27430 #
NAL-TR-1118 ..... p 3110 N92-27431 #
NAL-TR-1119 ..... p 3110 N92-27432 #

NAMRL-1366 ..... p 3142 N92-28164 #

NAS 1.15:101862 ..... p 3218 N92-27360 * #
NAS 1.15:105416 ..... p 3111 N92-27879 * #
NAS 1.15:105599 ..... p 3076 N92-27378 * #
NAS 1.15:105623 ..... p 3035 N92-27377 * #
NAS 1.15:105686 ..... p 3102 N92-27653 * #
NAS 1.15:105689 ..... p 3067 N92-27878 * #
NAS 1.15:105694 ..... p 3049 N92-27652 * #
NAS 1.15:105697 ..... p 3049 N92-27669 * #
NAS 1.15:105701 ..... p 3157 N92-27517 * #
NAS 1.15:105720 ..... p 3042 N92-28102 * #
NAS 1.15:105741 ..... p 3067 N92-27654 * #
NAS 1.15:107546 ..... p 3136 N92-27877 * #
NAS 1.15:107626 ..... p 3115 N92-27375 * #
NAS 1.15:107908 ..... p 3189 N92-27651 * #
NAS 1.15:107923 ..... p 3185 N92-28112 * #
NAS 1.15:107924 ..... p 3186 N92-28183 * #
NAS 1.15:107925 ..... p 3187 N92-28220 * #
NAS 1.15:107926 ..... p 3186 N92-28116 * #
NAS 1.15:107927 ..... p 3187 N92-28211 * #
NAS 1.15:107928 ..... p 3186 N92-28155 * #
NAS 1.15:107929 ..... p 3187 N92-28184 * #
NAS 1.15:107930 ..... p 3186 N92-28117 * #
NAS 1.15:107931 ..... p 3185 N92-28114 * #
NAS 1.15:107932 ..... p 3081 N92-28203 * #
NAS 1.15:107933 ..... p 3138 N92-28212 * #
NAS 1.15:107934 ..... p 3187 N92-28188 * #
NAS 1.15:107935 ..... p 3183 N92-28156 * #
NAS 1.15:107936 ..... p 3088 N92-28187 * #
NAS 1.15:107939 ..... p 3187 N92-28186 * #
NAS 1.15:107940 ..... p 3192 N92-28185 * #
NAS 1.15:107942 ..... p 3066 N92-28213 * #
NAS 1.15:107943 ..... p 3144 N92-28157 * #
NAS 1.15:107949 ..... p 3185 N92-28113 * #
NAS 1.15:107950 ..... p 3186 N92-28115 * #
NAS 1.15:107952 ..... p 3126 N92-28222 * #
NAS 1.15:4333 ..... p 3051 N92-27670 * #
NAS 1.15:4393 ..... p 3048 N92-27587 * #
NAS 1.15:4394 ..... p 3048 N92-27379 * #
NAS 1.21:6101(05) ..... p 3181 N92-27609 * #
NAS 1.21:7011(361) ..... p 3137 N92-27433 *
NAS 1.21:7037(277) ..... p 3035 N92-27929 *
NAS 1.26:184329 ..... p 3066 N92-27403 * #
NAS 1.26:185680 ..... p 3051 N92-28209 * #
NAS 1.26:186516 ..... p 3116 N92-27874 * #
NAS 1.26:188055 ..... p 3052 N92-27976 * #
NAS 1.26:189118 ..... p 3035 N92-27376 * #
NAS 1.26:189143 ..... p 3105 N92-27975 * #
NAS 1.26:189154 ..... p 3116 N92-27872 * #
NAS 1.26:189268 ..... p 3114 N92-27649 * #
NAS 1.26:189270 ..... p 3055 N92-28219 * #
NAS 1.26:189273 ..... p 3083 N92-27516 * #
NAS 1.26:189274 ..... p 3182 N92-27972 * #
NAS 1.26:189281 ..... p 3158 N92-28210 * #
NAS 1.26:189633 ..... p 3047 N92-27424 * #
NAS 1.26:189865 ..... p 3194 N92-28221 * #
NAS 1.26:189939 ..... p 3152 N92-28150 * #
NAS 1.26:189971 ..... p 3054 N92-27540 * #
NAS 1.26:190008 ..... p 3055 N92-27541 * #
NAS 1.26:190009 ..... p 3055 N92-27555 * #
NAS 1.26:190036 ..... p 3074 N92-27542 * #
NAS 1.26:190065 ..... p 3118 N92-27543 * #
NAS 1.26:190125 ..... p 3127 N92-27434 * #
NAS 1.26:190331 ..... p 3157 N92-27557 * #
NAS 1.26:190357 ..... p 3035 N92-27558 * #
NAS 1.26:190363 ..... p 3149 N92-27829 * #
NAS 1.26:190385 ..... p 3183 N92-27397 * #
NAS 1.26:190390 ..... p 3181 N92-27572 * #
NAS 1.26:190394 ..... p 3148 N92-27585 * #
NAS 1.26:190399 ..... p 3169 N92-27871 * #
NAS 1.26:190404 ..... p 3196 N92-27876 * #
NAS 1.26:190405 ..... p 3169 N92-27873 * #
NAS 1.26:190426 ..... p 3035 N92-27399 * #
NAS 1.26:190427 ..... p 3119 N92-27559 * #
NAS 1.26:190430 ..... p 3104 N92-27880 * #
NAS 1.26:190432 ..... p 3083 N92-27520 * #
NAS 1.26:190433 ..... p 3048 N92-27519 * #
NAS 1.26:190438 ..... p 3148 N92-27626 * #
NAS 1.26:190439 ..... p 3147 N92-27561 * #
NAS 1.26:190442 ..... p 3147 N92-27560 * #
NAS 1.26:190451 ..... p 3089 N92-27404 * #
NAS 1.26:190461 ..... p 3119 N92-28013 * #
NAS 1.26:190465 ..... p 3173 N92-27866 * #
NAS 1.26:4433 ..... p 3153 N92-27586 * #
NAS 1.26:4444 ..... p 3159 N92-27588 * #
NAS 1.55:10097 ..... p 3196 N92-27218 * #
NAS 1.55:10098 ..... p 3154 N92-27763 * #
NAS 1.55:3152-PT-1 ..... p 3056 N92-27721 * #
NAS 1.55:3152-PT-2 ..... p 3061 N92-27788 * #
NAS 1.60:3209 ..... p 3153 N92-27589 * #
NAS 1.60:3214 ..... p 3117 N92-27974 * #
NAS 1.61:1278 ..... p 3135 N92-27930 * #
NAS 1.83:151 ..... p 3182 N92-27843 * #

NASA-CP-10097 ..... p 3196 N92-27218 * #
NASA-CP-10098 ..... p 3154 N92-27763 * #
NASA-CP-3152-PT-1 ..... p 3056 N92-27721 * #
NASA-CP-3152-PT-2 ..... p 3061 N92-27788 * #

NASA-CR-184329 ..... p 3066 N92-27403 * #
NASA-CR-185680 ..... p 3051 N92-28209 * #
NASA-CR-186516 ..... p 3116 N92-27874 * #
NASA-CR-188055 ..... p 3052 N92-27976 * #
NASA-CR-189118 ..... p 3035 N92-27376 * #
NASA-CR-189143 ..... p 3105 N92-27975 * #
NASA-CR-189154 ..... p 3116 N92-27872 * #
NASA-CR-189268 ..... p 3114 N92-27649 * #
NASA-CR-189270 ..... p 3055 N92-28219 * #
NASA-CR-189273 ..... p 3083 N92-27516 * #
NASA-CR-189274 ..... p 3182 N92-27972 * #
NASA-CR-189281 ..... p 3158 N92-28210 * #
NASA-CR-189633 ..... p 3047 N92-27424 * #
NASA-CR-189865 ..... p 3194 N92-28221 * #
NASA-CR-189939 ..... p 3152 N92-28150 * #
NASA-CR-189971 ..... p 3054 N92-27540 * #
NASA-CR-190008 ..... p 3055 N92-27541 * #
NASA-CR-190009 ..... p 3055 N92-27555 * #
NASA-CR-190036 ..... p 3074 N92-27542 * #
NASA-CR-190065 ..... p 3118 N92-27543 * #
NASA-CR-190125 ..... p 3127 N92-27434 * #
NASA-CR-190331 ..... p 3157 N92-27557 * #
NASA-CR-190357 ..... p 3035 N92-27558 * #
NASA-CR-190363 ..... p 3149 N92-27829 * #
NASA-CR-190385 ..... p 3183 N92-27397 * #
NASA-CR-190390 ..... p 3181 N92-27572 * #
NASA-CR-190394 ..... p 3148 N92-27585 * #
NASA-CR-190399 ..... p 3169 N92-27871 * #
NASA-CR-190404 ..... p 3196 N92-27876 * #
NASA-CR-190405 ..... p 3169 N92-27873 * #
NASA-CR-190426 ..... p 3035 N92-27399 * #
NASA-CR-190427 ..... p 3119 N92-27559 * #
NASA-CR-190430 ..... p 3104 N92-27880 * #
NASA-CR-190432 ..... p 3083 N92-27520 * #
NASA-CR-190433 ..... p 3048 N92-27519 * #
NASA-CR-190438 ..... p 3148 N92-27626 * #
NASA-CR-190439 ..... p 3147 N92-27561 * #
NASA-CR-190442 ..... p 3147 N92-27560 * #
NASA-CR-190451 ..... p 3089 N92-27404 * #
NASA-CR-190461 ..... p 3119 N92-28013 * #
NASA-CR-190465 ..... p 3173 N92-27866 * #
NASA-CR-4433 ..... p 3153 N92-27586 * #
NASA-CR-4444 ..... p 3159 N92-27588 * #

NASA-NP-151 ..... p 3182 N92-27843 * #

NASA-RP-1278 ..... p 3135 N92-27930 * #

NASA-SP-6101(05) ..... p 3181 N92-27609 * #
NASA-SP-7011(361) ..... p 3137 N92-27433 *
NASA-SP-7037(277) ..... p 3035 N92-27929 *

NASA-TM-101862 ..... p 3218 N92-27360 * #
NASA-TM-105416 ..... p 3111 N92-27879 * #
NASA-TM-105599 ..... p 3076 N92-27378 * #
NASA-TM-105623 ..... p 3035 N92-27377 * #
NASA-TM-105686 ..... p 3102 N92-27653 * #
NASA-TM-105689 ..... p 3067 N92-27878 * #
NASA-TM-105694 ..... p 3049 N92-27652 * #
NASA-TM-105697 ..... p 3049 N92-27669 * #
NASA-TM-105701 ..... p 3157 N92-27517 * #
NASA-TM-105720 ..... p 3042 N92-28102 * #
NASA-TM-105741 ..... p 3067 N92-27654 * #
NASA-TM-107546 ..... p 3136 N92-27877 * #
NASA-TM-107626 ..... p 3115 N92-27375 * #
NASA-TM-107908 ..... p 3189 N92-27651 * #
NASA-TM-107923 ..... p 3185 N92-28112 * #
NASA-TM-107924 ..... p 3186 N92-28183 * #
NASA-TM-107925 ..... p 3187 N92-28220 * #
NASA-TM-107926 ..... p 3186 N92-28116 * #
NASA-TM-107927 ..... p 3187 N92-28211 * #
NASA-TM-107928 ..... p 3186 N92-28155 * #
NASA-TM-107929 ..... p 3187 N92-28184 * #
NASA-TM-107930 ..... p 3186 N92-28117 * #
NASA-TM-107931 ..... p 3185 N92-28114 * #
NASA-TM-107932 ..... p 3081 N92-28203 * #
NASA-TM-107933 ..... p 3138 N92-28212 * #
NASA-TM-107934 ..... p 3187 N92-28188 * #
NASA-TM-107935 ..... p 3183 N92-28156 * #
NASA-TM-107936 ..... p 3088 N92-28187 * #
NASA-TM-107939 ..... p 3187 N92-28186 * #
NASA-TM-107940 ..... p 3192 N92-28185 * #
NASA-TM-107942 ..... p 3066 N92-28213 * #
NASA-TM-107943 ..... p 3144 N92-28157 * #
NASA-TM-107949 ..... p 3185 N92-28113 * #
NASA-TM-107950 ..... p 3186 N92-28115 * #
NASA-TM-107952 ..... p 3126 N92-28222 * #
NASA-TM-4333 ..... p 3051 N92-27670 * #
NASA-TM-4393 ..... p 3048 N92-27587 * #
NASA-TM-4394 ..... p 3048 N92-27379 * #

NASA-TP-3209 ..... p 3153 N92-27589 * #
NASA-TP-3214 ..... p 3117 N92-27974 * #

NAVSWC-TR-91-460 ..... p 3084 N92-27717 #

NAVY-CASE-73480 ..... p 3106 N92-27823 #

NCSC-TR-79-91 ..... p 3185 N92-28040 #

NEAR-TR-443 ..... p 3105 N92-27986 #

NIIYAF-MGU-90-36-182 ..... p 3195 N92-27495 #

NISTIR-4740 ..... p 3150 N92-27923 #

NMAB-460 ..... p 3070 N92-28202 #

NOARL-TN-160 ..... p 3131 N92-28168 #
NOARL-TN-182 ..... p 3127 N92-27922 #
NOARL-TN-191 ..... p 3169 N92-27920 #
NOARL-TN-196 ..... p 3134 N92-27574 #
NOARL-TN-207 ..... p 3134 N92-27575 #

NOARL-13 ..... p 3130 N92-27842 #
NOARL-18 ..... p 3145 N92-27382 #

NOO-RP-34(91) ..... p 3135 N92-27667 #
NOO-RP-53 ..... p 3135 N92-27667 #

NOSC-TD-2220 ..... p 3083 N92-27565 #

NOSC-TR-1461 ..... p 3083 N92-27564 #

NPS-AS-92-006 ..... p 3180 N92-27528 #

NPS-OC-91-006 ..... p 3044 N92-28133 #

NPSOR-92-009 ..... p 3159 N92-27568 #

NRC-32128 ..... p 3104 N92-27693 #
NRC-32151 ..... p 3035 N92-27344 #

NRL-9372 ..... p 3139 N92-27535 #

NRL/MR/4681-92-6941 ..... p 3174 N92-27921 #
NRL/MR/4707-92-6905 ..... p 3172 N92-27563 #
NRL/MR/6505-92-6963 ..... p 3170 N92-28007 #

NSMRL-1171 ..... p 3163 N92-28011 #

NSSDC/WDC-A-R/S-87-05 ..... p 3187 N92-28186 * #
NSSDC/WDC-A-R/S-87-06 ..... p 3192 N92-28185 * #
NSSDC/WDC-A-R/S-87-09 ..... p 3088 N92-28187 * #
NSSDC/WDC-A-R/S-88-16 ..... p 3183 N92-28156 * #
NSSDC/WDC-A-R/S-89-23 ..... p 3187 N92-28188 * #

NUWC-NL-TR-10015 ..... p 3116 N92-27850 #

NWC-TP-7203 ..... p 3184 N92-27860 #

ORNL/CSD/TM-281 ..... p 3147 N92-27570 #

OSP-70391 ..... p 3119 N92-27559 * #

PAPER-92-2.9.1 ..... p 3048 N92-27587 * #

PASC005-01-00 ..... p 3069 N92-27849 #

PB92-134410 ..... p 3158 N92-27909 #
PB92-164383 ..... p 3081 N92-27715 #
PB92-164995 ..... p 3125 N92-28206 #

PB92-167311 ..... p 3072 N92-28207 #
PB92-170166 ..... p 3125 N92-28208 #
PB92-170224 ..... p 3133 N92-27515 #
PB92-172014 ..... p 3150 N92-27923 #

PCS-TR90-151 ..... p 3147 N92-27561 * #
PCS-TR90-152 ..... p 3148 N92-27626 * #
PCS-TR91-158 ..... p 3147 N92-27560 * #

PL-TR-91-1071 ..... p 3106 N92-27993 #
PL-TR-91-2076-VOL-2 ..... p 3085 N92-28003 #
PL-TR-91-2097 ..... p 3126 N92-27380 #
PL-TR-91-2167 ..... p 3082 N92-27506 #
PL-TR-91-2191-VOL-2 ..... p 3087 N92-28103 #
PL-TR-91-2206 ..... p 3127 N92-27594 #
PL-TR-91-2236 ..... p 3047 N92-28004 #
PL-TR-91-2248 ..... p 3044 N92-27964 #
PL-TR-91-3058 ..... p 3080 N92-28070 #
PL-TR-92-2021 ..... p 3130 N92-27845 #

PME-FM-91-3 ..... p 3104 N92-27757 #

PNL-8042 ..... p 3089 N92-27395 #

PNR-90802 ..... p 3048 N92-27422 #

PPL-103 ..... p 3173 N92-27648 #
PPL-104 ..... p 3174 N92-28195 #
PPL-105 ..... p 3175 N92-28204 #
PPL-106 ..... p 3174 N92-28194 #
PPL-107 ..... p 3175 N92-28205 #
PPL-108 ..... p 3175 N92-28196 #
PPL-110 ..... p 3172 N92-27449 #
PPL-111 ..... p 3175 N92-28197 #
PPL-113 ..... p 3175 N92-28198 #
PPL-114 ..... p 3173 N92-27882 #
PPL-115 ..... p 3173 N92-27582 #
PPL-116 ..... p 3173 N92-27883 #
PPL-117 ..... p 3172 N92-27448 #
PPL-118 ..... p 3173 N92-27581 #
PPL-119 ..... p 3172 N92-27580 #
PPL-121 ..... p 3172 N92-27579 #
PPL-122 ..... p 3174 N92-28193 #
PPL-123 ..... p 3172 N92-27447 #
PPL-125 ..... p 3171 N92-27446 #

R/D-5824-AN-01 ..... p 3049 N92-28073 #

RAY/RD/S-4705 ..... p 3090 N92-27656 #

RCC/MG-381-92 ..... p 3130 N92-27859 #

RDA-TR-0226129003-002 ..... p 3071 N92-27835 #

REPT-0012 ..... p 3141 N92-27971 #
REPT-14/91 ..... p 3118 N92-27408 #
REPT-1991 ..... p 3176 N92-27216 #
REPT-3 ..... p 3176 N92-27216 #
REPT-5-27959 ..... p 3138 N92-27968 #
REPT-554-FDD-91/125 ..... p 3194 N92-28221 * #
REPT-86PR1314 ..... p 3046 N92-27982 #
REPT-92-8945 ..... p 3160 N92-27423 #
REPT-92B00058 ..... p 3135 N92-27930 * #

RL-TR-91-312 ..... p 3178 N92-28165 #
RL-TR-91-317 ..... p 3168 N92-27756 #
RL-TR-91-343 ..... p 3084 N92-27758 #
RL-TR-91-359 ..... p 3144 N92-28063 #
RL-TR-91-372 ..... p 3091 N92-27847 #
RL-TR-91-377 ..... p 3092 N92-27992 #
RL-TR-91-383 ..... p 3170 N92-28181 #
RL-TR-91-80 ..... p 3082 N92-27386 #

RR-416 ..... p 3081 N92-27926 #

RSRE-MEMO-4561 ..... p 3085 N92-28005 #

RTI-83B-3627 ..... p 3089 N92-27401 #
RTI-83B-3628 ..... p 3176 N92-27381 #

RTI/3627/91-A ..... p 3089 N92-27401 #
RTI/3628/ANNUAL ..... p 3176 N92-27381 #

R11-1681 ..... p 3126 N92-28222 * #
R92-930033F ..... p 3091 N92-27759 #

S-763 ..... p 3117 N92-27974 * #

SAND-92-0031C ..... p 3154 N92-27748 #
SAND-92-0517C ..... p 3107 N92-28054 #

SBI-AD-E200944 ..... p 3044 N92-27964 #

SCT-91RR-31 ..... p 3043 N92-28052 #

SC5345.FR ..... p 3177 N92-27985 #

SEAS-(550)/IM-91/047-(52-404) . p 3194 N92-28221 * #

SLCET-TR-91-35 ..... p 3090 N92-27567 #

SR-1 ..... p 3127 N92-27594 #
SR-3 ..... p 3047 N92-28004 #

SRA-R92-910028F ..... p 3093 N92-28137 #

SSC-SSR-1311-VOL-3 ..... p 3075 N92-28139 #

SSC-352-VOL-3 ..... p 3075 N92-28139 #

SSM/92/1 ..... p 3158 N92-28060 #

STARS-TC-04040/001/00 ..... p 3150 N92-27919 #

SU-SLAC-PUB-5730 ..... p 3179 N92-28160 #
SU-SLAC-PUB-5743 ..... p 3166 N92-27413 #
SU-SLAC-PUB-5758 ..... p 3146 N92-27414 #
SU-SLAC-PUB-5759 ..... p 3154 N92-27368 #
SU-SLAC-PUB-5769 ..... p 3166 N92-28174 #

SU-SLAC-385 ..... p 3167 N92-27419 #
SU-SLAC-392 ..... p 3166 N92-28045 #

SU-TR-71 ..... p 3160 N92-28182 #

TCRL-36 ..... p 3048 N92-27519 * #

TDCK-TD-91-2907 ..... p 3108 N92-27443 #
TDCK-TD-91-3296 ..... p 3137 N92-27361 #
TDCK-TD-91-3305 ..... p 3138 N92-27444 #

TR-ME/ES-92-2 ..... p 3089 N92-27404 * #

TR-010 ..... p 3077 N92-27867 #
TR-10 ..... p 3077 N92-27704 #
TR-11-ONR ..... p 3168 N92-27720 #
TR-119 ..... p 3164 N92-28105 #
TR-121 ..... p 3072 N92-28120 #
TR-12 ..... p 3167 N92-27599 #
TR-21 ..... p 3091 N92-27840 #
TR-228 ..... p 3148 N92-27661 #
TR-2 ..... p 3164 N92-28008 #
TR-325 ..... p 3151 N92-28082 #
TR-382 ..... p 3181 N92-27590 #
TR-389 ..... p 3148 N92-27591 #
TR-68 ..... p 3153 N92-27586 * #
TR-6 ..... p 3092 N92-28080 #
TR-70 ..... p 3160 N92-28140 #
TR-7 ..... p 3178 N92-28081 #
TR-890 ..... p 3160 N92-27915 #
TR-9 ..... p 3177 N92-28077 #

TTU-124-894-83 ..... p 3169 N92-27873 * #

UAH-5-32589 ..... p 3169 N92-27871 * #

UCB-PTH-62/91 ..... p 3161 N92-27348 #

UCRL-CR-109407 ..... p 3089 N92-27366 #

UCRL-ID-109847 ..... p 3124 N92-27417 #
UCRL-ID-110151 ..... p 3080 N92-27418 #

UCRL-JC-107929 ..... p 3069 N92-27856 #
UCRL-JC-108207 ..... p 3166 N92-27365 #
UCRL-JC-109775 ..... p 3146 N92-27391 #

UCRL-MA-108542 ..... p 3145 N92-27367 #

UDR-TR-91-35 ..... p 3111 N92-27996 #

US-PATENT-APPL-SN-271546 ..... p 3168 N92-27616
US-PATENT-APPL-SN-318988 ..... p 3083 N92-27615
US-PATENT-APPL-SN-380175 ..... p 3089 N92-27445
US-PATENT-APPL-SN-497374 ..... p 3089 N92-27398
US-PATENT-APPL-SN-500839 ..... p 3077 N92-27618
US-PATENT-APPL-SN-545005 ..... p 3074 N92-27619
US-PATENT-APPL-SN-560702 ..... p 3169 N92-27999
US-PATENT-APPL-SN-582274 ..... p 3170 N92-28001
US-PATENT-APPL-SN-582277 ..... p 3163 N92-27998
US-PATENT-APPL-SN-583778 ..... p 3169 N92-27838
US-PATENT-APPL-SN-589102 ..... p 3092 N92-28000
US-PATENT-APPL-SN-589703 ..... p 3143 N92-27372
US-PATENT-APPL-SN-597127 ..... p 3108 N92-27617
US-PATENT-APPL-SN-597134 ..... p 3046 N92-28002
US-PATENT-APPL-SN-605901 ..... p 3054 N92-27374
US-PATENT-APPL-SN-625720 ..... p 3166 N92-27373
US-PATENT-APPL-SN-647312 ..... p 3110 N92-27629
US-PATENT-APPL-SN-652155 ..... p 3054 N92-27628
US-PATENT-APPL-SN-656163 ..... p 3067 N92-27627
US-PATENT-APPL-SN-673049 ..... p 3076 N92-27491
US-PATENT-APPL-SN-676772 ..... p 3080 N92-27492
US-PATENT-APPL-SN-762818 ..... p 3106 N92-27623 #

US-PATENT-CLASS-137-68.1 ..... p 3110 N92-27629
US-PATENT-CLASS-149-3 ..... p 3080 N92-27492
US-PATENT-CLASS-244-122 ..... p 3143 N92-27372
US-PATENT-CLASS-250-227.17 .. p 3170 N92-28001
US-PATENT-CLASS-250-231.18 .. p 3169 N92-27838
US-PATENT-CLASS-307-66 ..... p 3089 N92-27398
US-PATENT-CLASS-324-77 ..... p 3163 N92-27998
US-PATENT-CLASS-357-16 ..... p 3168 N92-27616
US-PATENT-CLASS-359-154 ..... p 3083 N92-27615
US-PATENT-CLASS-372-41 ..... p 3108 N92-27617
US-PATENT-CLASS-385-24 ..... p 3169 N92-27999
US-PATENT-CLASS-387-87 ..... p 3166 N92-27373
US-PATENT-CLASS-427-217 ..... p 3074 N92-27619
US-PATENT-CLASS-437-200 ..... p 3089 N92-27445
US-PATENT-CLASS-445-24 ..... p 3092 N92-28000
US-PATENT-CLASS-524-440 ..... p 3076 N92-27491
US-PATENT-CLASS-528-116 ..... p 3077 N92-27618
US-PATENT-CLASS-89-1.51 ..... p 3054 N92-27374
US-PATENT-CLASS-89-1.809 ..... p 3067 N92-27627
US-PATENT-CLASS-89-1.816 ..... p 3046 N92-28002
US-PATENT-CLASS-89-1.81 ..... p 3054 N92-27628

US-PATENT-5,028,864 ..... p 3163 N92-27998
US-PATENT-5,036,520 ..... p 3108 N92-27617
US-PATENT-5,043,378 ..... p 3076 N92-27491
US-PATENT-5,049,212 ..... p 3080 N92-27492
US-PATENT-5,057,047 ..... p 3092 N92-28000
US-PATENT-5,057,590 ..... p 3077 N92-27618
US-PATENT-5,057,697 ..... p 3089 N92-27398
US-PATENT-5,058,481 ..... p 3046 N92-28002
US-PATENT-5,060,550 ..... p 3067 N92-27627
US-PATENT-5,062,154 ..... p 3083 N92-27615
US-PATENT-5,063,290 ..... p 3170 N92-28001
US-PATENT-5,063,419 ..... p 3168 N92-27616
US-PATENT-5,063,958 ..... p 3110 N92-27629
US-PATENT-5,064,146 ..... p 3143 N92-27372
US-PATENT-5,064,268 ..... p 3166 N92-27373
US-PATENT-5,066,148 ..... p 3169 N92-27999
US-PATENT-5,066,613 ..... p 3089 N92-27445
US-PATENT-5,073,409 ..... p 3074 N92-27619
US-PATENT-5,073,711 ..... p 3169 N92-27838
US-PATENT-5,074,186 ..... p 3054 N92-27374
US-PATENT-5,085,122 ..... p 3054 N92-27628

USAARL-92-16 ..... p 3144 N92-28095 #
USAARL-92-8 ..... p 3143 N92-27991 #

UTD-GRL/9101 ..... p 3107 N92-27438 #

UTIAS-TN-275 ..... p 3103 N92-27683 #

UTIAS-337 ..... p 3116 N92-27633 #

VI-1707-B-VOL-2 ..... p 3087 N92-28103 #

WES/MP/GL-92-3 ..... p 3126 N92-27209 #

WES/TR/D-92-2 ..... p 3044 N92-28079 #

WES/TR/EL-92-17 ..... p 3151 N92-28006 #

WHOI-91-32 ..... p 3133 N92-27515 #
WHOI-92-11 ..... p 3181 N92-27553 #

WL-TM-91-307-FIBG ..... p 3050 N92-27577 #

WL-TR-91-2074 ..... p 3163 N92-27210 #
WL-TR-91-2124 ..... p 3107 N92-28217 #
WL-TR-91-2128 ..... p 3148 N92-27584 #
WL-TR-91-3014 ..... p 3043 N92-27682 #
WL-TR-91-3101 ..... p 3116 N92-27865 #
WL-TR-91-4006 ..... p 3071 N92-27514 #
WL-TR-91-4017 ..... p 3068 N92-27531 #
WL-TR-91-4086 ..... p 3111 N92-27996 #
WL-TR-91-4121 ..... p 3074 N92-28053 #
WL-TR-92-7007 ..... p 3089 N92-27353 #
WL-TR-92-8016 ..... p 3069 N92-27849 #

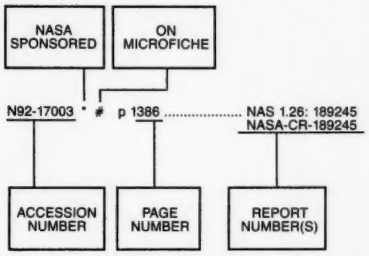
WRAIR-TR-91-001 ..... p 3143 N92-27990 #

WSRC-IM-90-83-5 ..... p 3151 N92-28048 #

WSRC-MS-91-017 ..... p 3079 N92-27363 #
WSRC-MS-91-420 ..... p 3117 N92-28041 #

WSU/DC/92-TR-83 ..... p 3170 N92-28125 #

Typical Accession Number Index Listing



Listings in this index are arranged alphanumerically by accession number. The page number helps to locate the citation in the abstract section. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

N92-27198 # p 3066 ..... AD-A246226
N92-27199 # p 3131 ..... AD-A246241
N92-27200 # p 3050 ..... AD-A246248
N92-27201 # p 3175 ..... AD-A246254
FTD-ID(RS)T-0695-91
N92-27202 # p 3162 ..... AD-A246257
N92-27203 # p 3109 ..... AD-A246428
N92-27204 # p 3088 ..... AD-A246429
N92-27205 # p 3159 ..... AD-A246432
ARL-STRUC-TM-579
DODA-AR-006-654
N92-27206 # p 3048 ..... AD-A246486
N92-27207 # p 3073 ..... AD-A246488
N92-27208 # p 3145 ..... AD-A246489
DTRC/SD-92/09
N92-27209 # p 3126 ..... AD-A246490
WES/MP/GL-92-3
N92-27210 # p 3163 ..... AD-A246492
WL-TR-91-2074
N92-27211 # p 3145 ..... AD-A246496
N92-27212 # p 3153 ..... AD-A247249
N92-27213 # p 3115 ..... AD-A247233
ARCCB-CR-92001
N92-27214 # p 3118 ..... AD-A247247
N92-27215 # p 3145 ..... AD-A247248
N92-27216 # p 3178 ..... AD-A247338
ESD-TR-91-153
REPT-1991
REPT-3
N92-27217 # p 3044 ..... AD-A247345
N92-27218* # p 3196 ..... NAS 1.55:10097
NASA-CP-10097
N92-27219* # p 3066 ..... NO REPORT NUMBER
N92-27220* # p 3066 ..... NO REPORT NUMBER
N92-27221* # p 3179 ..... NO REPORT NUMBER
N92-27222* # p 3188 ..... NO REPORT NUMBER
N92-27223* # p 3196 ..... NO REPORT NUMBER
N92-27224* # p 3196 ..... NO REPORT NUMBER
N92-27225* # p 3164 ..... NO REPORT NUMBER
N92-27226* # p 3164 ..... NO REPORT NUMBER
N92-27227* # p 3188 ..... NO REPORT NUMBER
N92-27228* # p 3164 ..... NO REPORT NUMBER
N92-27229* # p 3164 ..... NO REPORT NUMBER
N92-27230* # p 3165 ..... NO REPORT NUMBER
N92-27231* # p 3165 ..... NO REPORT NUMBER
N92-27232* # p 3165 ..... NO REPORT NUMBER
N92-27233* # p 3165 ..... NO REPORT NUMBER
N92-27234* # p 3165 ..... NO REPORT NUMBER
N92-27235* # p 3165 ..... NO REPORT NUMBER
N92-27236* # p 3165 ..... NO REPORT NUMBER
N92-27237* # p 3165 ..... NO REPORT NUMBER
N92-27238* # p 3165 ..... NO REPORT NUMBER
N92-27239* # p 3165 ..... NO REPORT NUMBER
N92-27240* # p 3165 ..... NO REPORT NUMBER
N92-27241* # p 3196 ..... NO REPORT NUMBER
N92-27242* # p 3165 ..... NO REPORT NUMBER
N92-27243* # p 3192 ..... NO REPORT NUMBER
N92-27244* # p 3192 ..... NO REPORT NUMBER
N92-27245* # p 3192 ..... NO REPORT NUMBER
N92-27246* # p 3192 ..... NO REPORT NUMBER
N92-27247* # p 3078 ..... NO REPORT NUMBER
N92-27248* # p 3070 ..... NO REPORT NUMBER
N92-27249* # p 3192 ..... NO REPORT NUMBER
N92-27250* # p 3192 ..... NO REPORT NUMBER
N92-27251* # p 3192 ..... NO REPORT NUMBER
N92-27252* # p 3192 ..... NO REPORT NUMBER
N92-27253* # p 3192 ..... NO REPORT NUMBER
N92-27254* # p 3192 ..... NO REPORT NUMBER
N92-27255* # p 3192 ..... NO REPORT NUMBER
N92-27256* # p 3193 ..... NO REPORT NUMBER
N92-27257* # p 3193 ..... NO REPORT NUMBER
N92-27258* # p 3193 ..... NO REPORT NUMBER
N92-27259* # p 3193 ..... NO REPORT NUMBER
N92-27260* # p 3193 ..... NO REPORT NUMBER
N92-27261* # p 3193 ..... NO REPORT NUMBER
N92-27262* # p 3073 ..... NO REPORT NUMBER
N92-27263* # p 3193 ..... NO REPORT NUMBER
N92-27264* # p 3193 ..... NO REPORT NUMBER
N92-27265* # p 3128 ..... NO REPORT NUMBER
N92-27266* # p 3145 ..... NO REPORT NUMBER
N92-27267* # p 3193 ..... NO REPORT NUMBER
N92-27268* # p 3178 ..... NO REPORT NUMBER
N92-27269* # p 3068 ..... NO REPORT NUMBER
N92-27270* # p 3188 ..... NO REPORT NUMBER
N92-27271* # p 3188 ..... NO REPORT NUMBER
N92-27272* # p 3078 ..... NO REPORT NUMBER
N92-27273* # p 3078 ..... NO REPORT NUMBER
N92-27274* # p 3070 ..... NO REPORT NUMBER
N92-27275* # p 3078 ..... NO REPORT NUMBER
N92-27276* # p 3078 ..... NO REPORT NUMBER
N92-27277* # p 3078 ..... NO REPORT NUMBER
N92-27278* # p 3078 ..... NO REPORT NUMBER
N92-27279* # p 3078 ..... NO REPORT NUMBER
N92-27280* # p 3079 ..... NO REPORT NUMBER
N92-27281* # p 3079 ..... NO REPORT NUMBER
N92-27282* # p 3079 ..... NO REPORT NUMBER
N92-27283* # p 3079 ..... NO REPORT NUMBER
N92-27284* # p 3165 ..... NO REPORT NUMBER
N92-27285* # p 3079 ..... NO REPORT NUMBER
N92-27286* # p 3073 ..... NO REPORT NUMBER
N92-27287* # p 3079 ..... NO REPORT NUMBER
N92-27288* # p 3079 ..... NO REPORT NUMBER
N92-27289* # p 3070 ..... NO REPORT NUMBER
N92-27290* # p 3070 ..... NO REPORT NUMBER
N92-27291* # p 3070 ..... NO REPORT NUMBER
N92-27292* # p 3079 ..... NO REPORT NUMBER
N92-27293* # p 3070 ..... NO REPORT NUMBER
N92-27294* # p 3070 ..... NO REPORT NUMBER
N92-27295* # p 3170 ..... NO REPORT NUMBER
N92-27296* # p 3075 ..... NO REPORT NUMBER
N92-27297* # p 3073 ..... NO REPORT NUMBER
N92-27298* # p 3073 ..... NO REPORT NUMBER
N92-27299* # p 3111 ..... NO REPORT NUMBER
N92-27300* # p 3079 ..... NO REPORT NUMBER
N92-27301* # p 3165 ..... NO REPORT NUMBER
N92-27302* # p 3166 ..... NO REPORT NUMBER
N92-27303* # p 3079 ..... NO REPORT NUMBER
N92-27304* # p 3111 ..... NO REPORT NUMBER
N92-27305* # p 3111 ..... NO REPORT NUMBER
N92-27306* # p 3170 ..... NO REPORT NUMBER
N92-27307* # p 3170 ..... NO REPORT NUMBER
N92-27308* # p 3170 ..... NO REPORT NUMBER
N92-27309* # p 3170 ..... NO REPORT NUMBER
N92-27310* # p 3170 ..... NO REPORT NUMBER
N92-27311* # p 3171 ..... NO REPORT NUMBER
N92-27312* # p 3107 ..... NO REPORT NUMBER
N92-27313* # p 3178 ..... NO REPORT NUMBER
N92-27314* # p 3171 ..... NO REPORT NUMBER
N92-27315* # p 3171 ..... NO REPORT NUMBER
N92-27316* # p 3171 ..... NO REPORT NUMBER
N92-27317* # p 3106 ..... NO REPORT NUMBER
N92-27318* # p 3178 ..... NO REPORT NUMBER
N92-27319* # p 3178 ..... NO REPORT NUMBER
N92-27320* # p 3124 ..... NO REPORT NUMBER
N92-27321* # p 3124 ..... NO REPORT NUMBER
N92-27322* # p 3136 ..... NO REPORT NUMBER
N92-27323* # p 3136 ..... NO REPORT NUMBER
N92-27324* # p 3188 ..... NO REPORT NUMBER
N92-27325* # p 3066 ..... NO REPORT NUMBER
N92-27326* # p 3171 ..... NO REPORT NUMBER
N92-27327* # p 3053 ..... NO REPORT NUMBER
N92-27328* # p 3107 ..... NO REPORT NUMBER
N92-27329* # p 3166 ..... NO REPORT NUMBER
N92-27330 # p 3171 ..... AD-A246129
N92-27331 # p 3138 ..... AD-A246953
AFOSR-92-0131TR
N92-27332 # p 3073 ..... AD-A246955
N92-27333 # p 3145 ..... AD-A246956
N92-27334 # p 3159 ..... AD-A246958
AFOSR-92-0156TR
N92-27335 # p 3045 ..... AD-A247026
N92-27336 # p 3128 ..... AD-A247030
AFOSR-92-0082TR
N92-27337 # p 3138 ..... AD-A247032
AFOSR-92-0103TR
N92-27338 # p 3166 ..... AD-A247033
N92-27339 # p 3082 ..... AD-A247034
N92-27340 # p 3131 ..... CGCR-91-1
CTN-92-60523
N92-27341 # p 3131 ..... CGCR-91-3
CTN-92-60524
N92-27342 # p 3132 ..... CGCR-91-5
CTN-92-60535
N92-27343 # p 3124 ..... CRG-89-4
CTN-92-60536
N92-27344 # p 3035 ..... CTN-92-60537
IAR-AN-74
NRC-32151
N92-27345 # p 3176 ..... ANL/CP-75540
CONF-920199-1
DE92-010252
N92-27346 # p 3073 ..... ANL/CP-74100
CONF-911111-40
DE92-010253
N92-27347 # p 3126 ..... DE92-010467
LBL-31674
N92-27348 # p 3161 ..... CONF-9107201-1
DE92-010476
LBL-31432
UCB-PTH-62/91
N92-27349 # p 3136 ..... CONF-8908169-1
DE92-010477
LBL-27728-REV
N92-27350 # p 3142 ..... AD-A246821
N92-27351 # p 3163 ..... AD-A246866
N92-27352 # p 3094 ..... AD-A246960
AFOSR-92-0088TR
N92-27353 # p 3089 ..... AD-A247325
WL-TR-92-7007
N92-27354 # p 3107 ..... AD-A247326
AFOSR-92-0006TR
N92-27355 # p 3126 ..... CRG-89-5-PT-1
CTN-92-60532
N92-27356 # p 3132 ..... CGCR-91-6
CTN-92-60533
N92-27357 # p 3132 ..... CGCR-90-12
CTN-92-60534
N92-27358 # p 3143 ..... CTN-92-60539
N92-27359 # p 3124 ..... CGCR-89-9
CTN-92-60540
N92-27360* # p 3218 ..... NAS 1.15:101862
NASA-TM-101862
N92-27361 # p 3137 ..... AD-A245385
IZF-1991-B-12
TDCK-TD-91-3296
N92-27362 # p 3171 ..... CONF-920439-3
DE92-009386
N92-27363 # p 3079 ..... CONF-910920-28
DE92-010061
WSRC-MS-91-017
N92-27364 # p 3075 ..... CONF-9110352-1
DE92-010120
N92-27365 # p 3166 ..... CONF-9109230-14
DE92-010441
UCRL-JC-108207
N92-27366 # p 3089 ..... DE92-010445
UCRL-CR-109407
N92-27367 # p 3145 ..... DE92-010446
UCRL-MA-108542
N92-27368 # p 3154 ..... CONF-920172-4
DE92-010745

SU-SLAC-PUB-5759
N92-27369 # p 3162 ..... AD-A247149
N92-27370 # p 3132 ..... CGCR-91-22
CTN-92-60525
N92-27371 # p 3137 ..... AD-A247872
NADC-91079-60
N92-27372 p 3143 ..... AD-D015244
US-PATENT-APPL-SN-589703
US-PATENT-CLASS-244-122
US-PATENT-5,064,146
N92-27373 p 3166 ..... AD-D015246
US-PATENT-APPL-SN-625720
US-PATENT-CLASS-387-87
US-PATENT-5,064,268
N92-27374 p 3054 ..... AD-D015247
US-PATENT-APPL-SN-605901
US-PATENT-CLASS-89-1.51
US-PATENT-5,074,186
N92-27375* # p 3115 ..... AIAA-PAPER-92-2264
NAS 1.15:107626
NASA-TM-107626
N92-27376* # p 3035 ..... E-6828
NAS 1.26:189118
NASA-CR-189118
N92-27377* # p 3035 ..... E-6962
NAS 1.15:105623
NASA-TM-105623
N92-27378* # p 3076 ..... E-6935
NAS 1.15:105599
NASA-TM-105599
N92-27379* # p 3048 ..... AIAA-PAPER-92-4106
H-1817
NAS 1.15:4394
NASA-TM-4394
N92-27380 # p 3126 ..... AD-A246890
AD-E200854
PL-TR-91-2097
N92-27381 # p 3176 ..... AD-A246991
RTI-83B-3628
RTI/3628/ANNUAL
N92-27382 # p 3145 ..... AD-A247206
AD-E040219
NOARL-18
N92-27383 # p 3068 ..... AD-A247230
NADC-91062-60
N92-27384 # p 3159 ..... AD-A247253
N92-27385 # p 3106 ..... AD-A247287
AFOSR-92-0005TR
LTR91-018
N92-27386 # p 3082 ..... AD-A247350
RL-TR-91-80
N92-27387 # p 3146 ..... AD-A247853
N92-27388 # p 3055 ..... AD-A247855
JSR-91-330A
N92-27389 # p 3154 ..... AD-A247859
N92-27390 # p 3195 ..... ANL/HEP/CP-91-113
CONF-9108141-3
DE92-010350
N92-27391 # p 3146 ..... CONF-9204106-1
DE92-010401
UCRL-JC-109775
N92-27392 # p 3123 ..... ANL/CP-73835
CONF-9205129-1
DE92-010515
N92-27393 # p 3107 ..... DE92-010609
DOE/ER-12821/T1
N92-27394 # p 3109 ..... DE92-010622
DOE/ER-30148/T1
N92-27395 # p 3089 ..... DE92-010630
PNL-8042
N92-27396 # p 3163 ..... DE92-010651
DOE/ER-13500/3
N92-27397* # p 3183 ..... NAS 1.26:190385
NASA-CR-190385
N92-27398 p 3089 ..... AD-D015206
US-PATENT-APPL-SN-497374
US-PATENT-CLASS-307-66
US-PATENT-5,057,697
N92-27399* # p 3035 ..... NAS 1.26:190426
NASA-CR-190426
N92-27400 # p 3082 ..... AD-A246969
N92-27401 # p 3089 ..... AD-A246989
RTI-83B-3627
RTI/3627/91-A
N92-27402 # p 3176 ..... AD-A246990
N92-27403* # p 3066 ..... ERC-R-92-022
NAS 1.26:184329
NASA-CR-184329
N92-27404* # p 3089 ..... NAS 1.26:190451
NASA-CR-190451
TR-ME/ES-92-2
N92-27405 # p 3195 ..... ETN-92-90827
N92-27406 # p 3159 ..... ETN-92-90828
N92-27407 # p 3094 ..... ETN-92-90829
MITT-90-01
N92-27408 # p 3118 ..... ETN-92-90832
REPT-14/91
N92-27409 # p 3176 ..... ANL/CP-75687
CONF-9203110-2
DE92-010499
N92-27410 # p 3110 ..... ANL/CP-75676
CONF-920439-4
DE92-010500
N92-27411 # p 3161 ..... ANL/CP-74708
CONF-920408-1
DE92-010502
N92-27412 # p 3076 ..... ANL/CP-75656
CONF-9011279-1
DE92-010508
N92-27413 # p 3166 ..... CONF-880594-6
DE92-010743
SU-SLAC-PUB-5743
N92-27414 # p 3146 ..... CONF-920172-5
DE92-010744
SU-SLAC-PUB-5758
N92-27415 # p 3194 ..... DE92-011021
DOE/ER-40479/T1
N92-27416 # p 3074 ..... DE92-011058
DOE/ER-45360/T4
N92-27417 # p 3124 ..... DE92-011072
UCRL-ID-109847
N92-27418 # p 3080 ..... DE92-011074
UCRL-ID-110151
N92-27419 # p 3167 ..... DE92-011076
SU-SLAC-385
N92-27420 # p 3128 ..... BONN-IR-91-15
ETN-92-90833
ISSN-0172-8741
N92-27421 # p 3163 ..... BONN-IR-91-13
ETN-92-90834
ISSN-0172-8741
N92-27422 # p 3048 ..... ETN-92-90845
PNR-90802
N92-27423 # p 3160 ..... ISBN-0-309-04629-7
REPT-92-8945
N92-27424* # p 3047 ..... ASL-91-2
NAS 1.26:189633
NASA-CR-189633
N92-27425 # p 3128 ..... CGCR-90-17
CTN-92-60526
N92-27426 # p 3124 ..... CGCR-89-7
CTN-92-60527
N92-27427 # p 3129 ..... CGCR-91-14
CTN-92-60528
N92-27428 # p 3051 ..... ISSN-0452-2982
JTN-92-80364
NAL-TM-638
N92-27429 # p 3045 ..... ISSN-0452-2982
JTN-92-80375
NAL-TM-637
N92-27430 # p 3067 ..... ISSN-0389-4010
JTN-92-80384
NAL-TR-1117
N92-27431 # p 3110 ..... ISSN-0389-4010
JTN-92-80385
NAL-TR-1118
N92-27432 # p 3110 ..... ISSN-0389-4010
JTN-92-80386
NAL-TR-1119
N92-27433* p 3137 ..... NAS 1.21:7011(361)
NASA-SP-7011(361)
N92-27434* # p 3127 ..... NAS 1.26:190125
NASA-CR-190125
N92-27435 # p 3167 ..... AD-A245364
N92-27436 # p 3146 ..... AD-A245366
AFIT/EN-TR-91-10
N92-27437 # p 3157 ..... AD-A245371
DREV-4653/91
N92-27438 # p 3107 ..... AD-A245372
UTD-GRL/9101
N92-27439 # p 3110 ..... AD-A245373
LMI-PL105R1
N92-27440 # p 3180 ..... AD-A245376
N92-27441 # p 3154 ..... AD-A245377
N92-27442 # p 3076 ..... AD-A245380
ARO-25286-CH
N92-27443 # p 3108 ..... AD-A245383
FEL-91-A159
TDCK-TD-91-2907
N92-27444 # p 3138 ..... AD-A245384
IZF-1991-B-15
TDCK-TD-91-3305
N92-27445 p 3089 ..... AD-D015208
US-PATENT-APPL-SN-380175
US-PATENT-CLASS-437-200
US-PATENT-5,066,613
N92-27446 # p 3171 ..... CTN-92-60499
PPL-125
N92-27447 # p 3172 ..... CTN-92-60501
PPL-123
N92-27448 # p 3172 ..... CTN-92-60507
PPL-117
N92-27449 # p 3172 ..... CTN-92-60514
PPL-110
N92-27450 # p 3094 ..... AGARD-CP-510
ISBN-92-835-0659-6
N92-27451 # p 3094 ..... NO REPORT NUMBER
N92-27452 # p 3094 ..... NO REPORT NUMBER
N92-27453 # p 3095 ..... NO REPORT NUMBER
N92-27454 # p 3095 ..... NO REPORT NUMBER
N92-27455 # p 3095 ..... NO REPORT NUMBER
N92-27456 # p 3095 ..... NO REPORT NUMBER
N92-27457 # p 3095 ..... NO REPORT NUMBER
N92-27458* # p 3095 ..... NO REPORT NUMBER
N92-27459* # p 3096 ..... NO REPORT NUMBER
N92-27460 # p 3096 ..... NO REPORT NUMBER
N92-27461 # p 3049 ..... NO REPORT NUMBER
N92-27462 # p 3050 ..... NO REPORT NUMBER
N92-27463 # p 3050 ..... NO REPORT NUMBER
N92-27464 # p 3050 ..... NO REPORT NUMBER
N92-27465 # p 3097 ..... NO REPORT NUMBER
N92-27466 # p 3050 ..... NO REPORT NUMBER
N92-27467* # p 3097 ..... NO REPORT NUMBER
N92-27468 # p 3097 ..... NO REPORT NUMBER
N92-27469 # p 3050 ..... NO REPORT NUMBER
N92-27470 # p 3098 ..... NO REPORT NUMBER
N92-27471 # p 3098 ..... NO REPORT NUMBER
N92-27472 # p 3098 ..... NO REPORT NUMBER
N92-27473 # p 3098 ..... NO REPORT NUMBER
N92-27474 # p 3098 ..... NO REPORT NUMBER
N92-27475 # p 3098 ..... NO REPORT NUMBER
N92-27476 # p 3098 ..... NO REPORT NUMBER
N92-27477 # p 3099 ..... NO REPORT NUMBER
N92-27478 # p 3099 ..... NO REPORT NUMBER
N92-27479 # p 3099 ..... NO REPORT NUMBER
N92-27480 # p 3099 ..... NO REPORT NUMBER
N92-27481 # p 3099 ..... NO REPORT NUMBER
N92-27482 # p 3100 ..... NO REPORT NUMBER
N92-27483 # p 3100 ..... NO REPORT NUMBER
N92-27484 # p 3050 ..... NO REPORT NUMBER
N92-27485 # p 3100 ..... NO REPORT NUMBER
N92-27486 # p 3073 ..... NO REPORT NUMBER
N92-27487 # p 3100 ..... NO REPORT NUMBER
N92-27488 # p 3101 ..... NO REPORT NUMBER
N92-27489 # p 3101 ..... NO REPORT NUMBER
N92-27490 # p 3101 ..... NO REPORT NUMBER
N92-27491 p 3076 ..... AD-D015194
US-PATENT-APPL-SN-673049
US-PATENT-CLASS-524-440
US-PATENT-5,043,378
N92-27492 p 3080 ..... AD-D015195
US-PATENT-APPL-SN-676772
US-PATENT-CLASS-149-3
US-PATENT-5,049,212
N92-27493 # p 3195 ..... DE92-620916
EFI-1274-60-90
N92-27494 # p 3195 ..... DE92-620924
EFI-1286-72-90
N92-27495 # p 3195 ..... DE92-620935
NIIYAF-MGU-90-36-182
N92-27496 # p 3183 ..... BARC-1549
DE92-621016
N92-27497 # p 3184 ..... BARC-1991/E/010
DE92-621018
N92-27498 # p 3164 ..... DE92-621061
IFT-P-002/91
N92-27499 # p 3179 ..... AD-A246565
N92-27500 # p 3139 ..... AD-A246586
DOT/FAA/AM-92/6
N92-27501 # p 3139 ..... AD-A246588
DOT/FAA/AM-92/9
N92-27502 # p 3132 ..... AD-A246589
N92-27503 # p 3082 ..... AD-A246592
N92-27504 # p 3146 ..... AD-A246594
N92-27505 # p 3050 ..... AD-A246596
N92-27506 # p 3082 ..... AD-A246893
AD-E200867
ERP-1088
PL-TR-91-2167
N92-27507 # p 3133 ..... AD-A246920
N92-27508 # p 3090 ..... AD-A246928
N92-27509 # p 3139 ..... AD-A246932
CN-ONR-1
N92-27510 # p 3071 ..... AD-A247265
AFOSR-92-0073TR
N92-27511 # p 3125 ..... AD-A247629
JSR-91-300
N92-27512 # p 3139 ..... AD-A247860
AFOSR-92-0112TR
N92-27513 # p 3090 ..... AD-A247871
N92-27514 # p 3071 ..... AD-A247880
WL-TR-91-4006
N92-27515 # p 3133 ..... PB92-170224
WHOI-91-32
N92-27516* # p 3083 ..... NAS 1.26:189273
NASA-CR-189273
N92-27517* # p 3157 ..... AIAA-92-3861
E-7089

NAS 1.15:105701
NASA-TM-105701
N92-27518 # p 3180 ..... DOT/FAA/RD-92/5
N92-27519* # p 3048 ..... ISU-ERI-AMES-92114
NAS 1.26:190433
NASA-CR-190433
TCRL-36
N92-27520* # p 3083 ..... NAS 1.26:190432
NASA-CR-190432
N92-27521 # p 3067 ..... AD-A245999
N92-27522 # p 3146 ..... AD-A246002
N92-27523 # p 3180 ..... AD-A246080
N92-27524 # p 3147 ..... AD-A246081
N92-27525 # p 3153 ..... AD-A246082
N92-27526 # p 3180 ..... AD-A246086
N92-27527 # p 3178 ..... AD-A246524
N92-27528 # p 3180 ..... AD-A246525
NPS-AS-92-006
N92-27529 # p 3101 ..... AD-A246531
N92-27530 # p 3053 ..... AD-A246553
N92-27531 # p 3068 ..... AD-A246559
WL-TR-91-4017
N92-27532 # p 3162 ..... AD-A246572
N92-27533 # p 3133 ..... AD-A246574
N92-27534 # p 3054 ..... AD-A246576
N92-27535 # p 3139 ..... AD-A246611
NRL-9372
N92-27536 # p 3184 ..... AD-A246613
LMI-DL001-01R1
N92-27537 # p 3140 ..... AD-A246623
AFIT/GLM/LSM/91S-44
N92-27538 # p 3140 ..... AD-A247174
N92-27539 # p 3076 ..... AD-A247557
COE/DC-TR-REMR-EM-7
N92-27540* # p 3054 ..... NAS 1.26:189971
NASA-CR-189971
N92-27541* # p 3055 ..... NAS 1.26:190008
NASA-CR-190008
N92-27542* # p 3074 ..... MIT/OSP-99328
NAS 1.26:190036
NASA-CR-190036
N92-27543* # p 3118 ..... NAS 1.26:190065
NASA-CR-190065
N92-27544 # p 3147 ..... AD-A245956
N92-27545 # p 3077 ..... AD-A246055
N92-27546 # p 3101 ..... AD-A246918
AFOSR-92-0100TR
N92-27547 # p 3133 ..... CGCR-91-17
CTN-92-60520
N92-27548 # p 3133 ..... CGCR-90-10
CTN-92-60521
N92-27549 # p 3133 ..... CGCR-90-4
CTN-92-60522
N92-27550 # p 3077 ..... AD-A247449
ESM91-1.0-MECH
N92-27551 # p 3129 ..... AD-A247588
AWS/TN-91/001
N92-27552 # p 3180 ..... AD-A247631
N92-27553 # p 3181 ..... AD-A247636
WHOI-92-11
N92-27554 # p 3118 ..... AD-A247651
DMA-TM-8356.1
N92-27555* # p 3055 ..... NAS 1.26:190009
NASA-CR-190009
N92-27556 # p 3161 ..... NO REPORT NUMBER
N92-27557* # p 3157 ..... NAS 1.26:190331
NASA-CR-190331
N92-27558* # p 3035 ..... NAS 1.26:190357
NASA-CR-190357
N92-27559* # p 3119 ..... NAS 1.26:190427
NASA-CR-190427
OSP-70391
N92-27560* # p 3147 ..... NAS 1.26:190442
NASA-CR-190442
PCS-TR91-158
N92-27561* # p 3147 ..... NAS 1.26:190439
NASA-CR-190439
PCS-TR90-151
N92-27562 # p 3080 ..... AD-A247559
N92-27563 # p 3172 ..... AD-A247560
NRL/MR/4707-92-6905
N92-27564 # p 3083 ..... AD-A247569
NOSC-TR-1461
N92-27565 # p 3083 ..... AD-A247570
NOSC-TD-2220
N92-27566 # p 3108 ..... AD-A247574
N92-27567 # p 3090 ..... AD-A247577
SLCET-TR-91-35
N92-27568 # p 3159 ..... AD-A247591
NPSOR-92-009
N92-27569 # p 3147 ..... AD-A247592
N92-27570 # p 3147 ..... DE92-010727
ORNL/CSD/TM-281
N92-27571 # p 3125 ..... ANL/CP-75645
CONF-920198-1
DE92-010280
N92-27572* # p 3181 ..... NAS 1.26:190390
NASA-CR-190390
N92-27573 # p 3115 ..... AD-A245921
CRREL-SR-91-21
N92-27574 # p 3134 ..... AD-A246145
AD-E040168
NOARL-TN-196
N92-27575 # p 3134 ..... AD-A246146
AD-E040166
NOARL-TN-207
N92-27576 # p 3147 ..... AD-A246147
N92-27577 # p 3050 ..... AD-A246149
WL-TM-91-307-FIBG
N92-27578 # p 3159 ..... AD-A246155
N92-27579 # p 3172 ..... CTN-92-60503
PPL-121
N92-27580 # p 3172 ..... CTN-92-60505
PPL-119
N92-27581 # p 3173 ..... CTN-92-60506
PPL-118
N92-27582 # p 3173 ..... CTN-92-60518
PPL-115
N92-27583 # p 3134 ..... AD-A247561
N92-27584 # p 3148 ..... AD-A247567
WL-TR-91-2128
N92-27585* # p 3148 ..... NAS 1.26:190394
NASA-CR-190394
N92-27586* # p 3153 ..... NAS 1.26:4433
NASA-CR-4433
TR-68
N92-27587* # p 3048 ..... H-1811
NAS 1.15:4393
NASA-TM-4393
PAPER-92-2.9.1
N92-27588* # p 3159 ..... M-889
NAS 1.26:4444
NASA-CR-4444
N92-27589* # p 3153 ..... L-17015
NAS 1.60:3209
NASA-TP-3209
N92-27590 # p 3181 ..... AD-A247447
TR-382
N92-27591 # p 3148 ..... AD-A247448
TR-389
N92-27592 # p 3077 ..... AD-A247450
ESM91-2.0-MECH
N92-27593 # p 3218 ..... AD-A247452
N92-27594 # p 3127 ..... AD-A247554
AD-E200902
PL-TR-91-2206
SR-1
N92-27595 # p 3167 ..... AD-A247555
N92-27596 # p 3167 ..... AD-A247556
N92-27597 # p 3167 ..... AD-A247618
N92-27598 # p 3176 ..... AD-A247619
N92-27599 # p 3167 ..... AD-A247628
TR-12
N92-27600 # p 3083 ..... AD-A246047
N92-27601 # p 3108 ..... AD-A246159
N92-27602 # p 3114 ..... AD-A246167
N92-27603 # p 3173 ..... AD-A246206
N92-27604 # p 3134 ..... AD-A246218
AD-E040178
INO-TM-6
N92-27605 # p 3153 ..... AD-A246474
N92-27606 # p 3148 ..... AD-A246477
AD-E951749
AMSMI/TR-RD-BA-91-1
N92-27607 # p 3177 ..... AD-A246478
AD-E951748
AMSMI/TR-RD-SS-91-10
N92-27608 # p 3167 ..... AD-A247616
N92-27609* # p 3181 ..... NAS 1.21:6101(05)
NASA-SP-6101(05)
N92-27610 # p 3129 ..... CTN-92-60459
ISBN-0-315-54644-1
N92-27611 # p 3190 ..... CTN-92-60466
ISBN-0-315-47774-1
N92-27612 # p 3056 ..... CTN-92-60467
ISBN-0-315-56953-0
N92-27613 # p 3056 ..... CTN-92-60472
ISBN-0-315-54650-6
N92-27614 # p 3068 ..... CTN-92-60490
N92-27615 p 3083 ..... AD-D015213
US-PATENT-APPL-SN-318988
US-PATENT-CLASS-359-154
US-PATENT-5,062,154
N92-27616 p 3168 ..... AD-D015217
US-PATENT-APPL-SN-271546
US-PATENT-CLASS-357-16
US-PATENT-5,063,419
N92-27617 p 3108 ..... AD-D015220
US-PATENT-APPL-SN-597127
US-PATENT-CLASS-372-41
US-PATENT-5,036,520
N92-27618 p 3077 ..... AD-D015221
US-PATENT-APPL-SN-500839
US-PATENT-CLASS-528-116
US-PATENT-5,057,590
N92-27619 p 3074 ..... AD-D015222
US-PATENT-APPL-SN-545005
US-PATENT-CLASS-427-217
US-PATENT-5,073,409
N92-27620 # p 3127 ..... CTN-92-60457
ISBN-0-315-57927-7
N92-27621 # p 3134 ..... CTN-92-60461
ISBN-0-315-56167-X
N92-27622 # p 3129 ..... CTN-92-60462
ISBN-0-315-55186-0
N92-27623 # p 3190 ..... CTN-92-60464
ISBN-0-315-55826-1
N92-27624 # p 3036 ..... CTN-92-60471
ISBN-0-315-51095-1
N92-27625 # p 3168 ..... CTN-92-60475
ISBN-0-315-49255-4
N92-27626* # p 3148 ..... NAS 1.26:190438
NASA-CR-190438
PCS-TR90-152
N92-27627 p 3067 ..... AD-D015239
US-PATENT-APPL-SN-658163
US-PATENT-CLASS-89-1.809
US-PATENT-5,060,550
N92-27628 p 3054 ..... AD-D015240
US-PATENT-APPL-SN-652155
US-PATENT-CLASS-89-1.81
US-PATENT-5,085,122
N92-27629 p 3110 ..... AD-D015241
US-PATENT-APPL-SN-647312
US-PATENT-CLASS-137-68.1
US-PATENT-5,063,958
N92-27630 # p 3106 ..... AD-A246507
N92-27631 # p 3080 ..... AD-A246510
N92-27632 # p 3177 ..... AD-A246511
N92-27633 # p 3116 ..... CTN-92-60451
ISSN-0082-5255
UTIAS-337
N92-27634 # p 3071 ..... CTN-92-60454
N92-27635 p 3195 ..... NO REPORT NUMBER
N92-27636 p 3188 ..... NO REPORT NUMBER
N92-27637 p 3193 ..... NO REPORT NUMBER
N92-27638 # p 3161 ..... CTN-92-60455
ISBN-0-315-56216-1
N92-27639 # p 3090 ..... CTN-92-60456
ISBN-0-315-57980-3
N92-27640 p 3190 ..... NO REPORT NUMBER
N92-27641 # p 3125 ..... CGCR-91-10
CTN-92-60458
N92-27642 # p 3127 ..... CTN-92-60463
ISBN-0-315-57198-5
N92-27643 p 3116 ..... NO REPORT NUMBER
N92-27644 # p 3189 ..... CTN-92-60465
ISBN-0-315-54703-0
N92-27645 # p 3051 ..... CTN-92-60468
ISBN-0-315-59945-6
N92-27646 # p 3056 ..... CTN-92-60470
ISBN-0-315-56001-0
N92-27647 # p 3108 ..... CTN-92-60473
ISBN-0-315-58085-2
N92-27648 # p 3173 ..... CTN-92-60474
PPL-103
N92-27649* # p 3114 ..... NAS 1.26:189268
NASA-CR-189268
N92-27650 # p 3068 ..... CTN-92-60488
N92-27651* # p 3189 ..... FIA-91-31
NAS 1.15:107908
NASA-TM-107908
N92-27652* # p 3049 ..... AIAA-92-3090
E-7062
NAS 1.15:105694
NASA-TM-105694
N92-27653* # p 3102 ..... AIAA-92-3082
E-7065
NAS 1.15:105686
NASA-TM-105686
N92-27654* # p 3067 ..... AIAA-92-3445
E-7146
NAS 1.15:105741
NASA-TM-105741
N92-27655 # p 3129 ..... AD-A246010
N92-27656 # p 3090 ..... AD-A246032
RAY/RD/S-4705
N92-27657 # p 3108 ..... AD-A246037
FTD-ID(RS)T-1475-90
N92-27658 # p 3160 ..... AD-A246038
FTD-ID(RS)T-1472-90
N92-27659 # p 3108 ..... AD-A246044
N92-27660 # p 3083 ..... AD-A246045
N92-27661 # p 3148 ..... AD-A246263
TR-228
N92-27662 # p 3090 ..... AD-A246268
DREO-1114
N92-27663 # p 3148 ..... AD-A246269

DREO-1095
N92-27664 # p 3143 ..... AD-A246272
DREO-TN-9122
N92-27665 # p 3181 ..... AD-A246397
N92-27666 # p 3135 ..... AD-A246444
N92-27667 # p 3135 ..... AD-A246452
NOO-RP-34(91)
NOO-RP-53
N92-27668 # p 3129 ..... AD-A246499
N92-27669* # p 3049 ..... AIAA-92-3789
E-7085
NAS 1.15:105697
NASA-TM-105697
N92-27670* # p 3051 ..... L-16838
NAS 1.15:4333
NASA-TM-4333
N92-27671 # p 3102 ..... AGARD-R-787
ISBN-92-835-0671-5
N92-27672 # p 3102 ..... NO REPORT NUMBER
N92-27673 # p 3102 ..... NO REPORT NUMBER
N92-27674 # p 3102 ..... NO REPORT NUMBER
N92-27675 # p 3102 ..... NO REPORT NUMBER
N92-27676* # p 3103 ..... NO REPORT NUMBER
N92-27677* # p 3103 ..... NO REPORT NUMBER
N92-27678 # p 3103 ..... NO REPORT NUMBER
N92-27679 # p 3103 ..... NO REPORT NUMBER
N92-27680 # p 3103 ..... NO REPORT NUMBER
N92-27681 # p 3181 ..... AD-A247054
N92-27682 # p 3043 ..... AD-A247195
WL-TR-91-3014
N92-27683 # p 3103 ..... CTN-92-60452
ISSN-0082-5263
UTIAS-TN-275
N92-27684 # p 3189 ..... CTN-92-60477
ISBN-0-315-56945-X
N92-27685 # p 3195 ..... CTN-92-60478
ISBN-0-315-56913-1
N92-27686 # p 3189 ..... CTN-92-60479
ISBN-0-315-53743-4
N92-27687 # p 3190 ..... CTN-92-60480
ISBN-0-315-59910-3
N92-27688 # p 3179 ..... CTN-92-60482
ISBN-0-315-60751-3
N92-27689 # p 3191 ..... CTN-92-60483
ISBN-0-315-60772-6
N92-27690 # p 3191 ..... CTN-92-60486
ISBN-0-315-54662-X
N92-27691 # p 3164 ..... CTN-92-60487
ISBN-0-315-50129-4
N92-27692 # p 3081 ..... CTN-92-60489
N92-27693 # p 3104 ..... CTN-92-60492
IME-CFE-TR-001
NRC-32128
N92-27694 # p 3071 ..... CTN-92-60493
N92-27695 # p 3084 ..... CTN-92-60496
DREO-TN-91-10
N92-27696 # p 3130 ..... AD-A247181
AFOSR-92-0019TR
CASS-GR-013
N92-27697 # p 3149 ..... CTN-92-60453
DREA-91-302
N92-27698 # p 3109 ..... CTN-92-60476
ISBN-0-315-49569-3
N92-27699 # p 3191 ..... CTN-92-60481
ISBN-0-315-61634-2
N92-27700 # p 3189 ..... CTN-92-60484
ISBN-0-315-61537-0
N92-27701 # p 3191 ..... CTN-92-60485
ISBN-0-315-61539-7
N92-27702 # p 3137 ..... CTN-92-60494
DREO-CR-91-646
N92-27703 # p 3181 ..... CTN-92-60495
N92-27704 # p 3077 ..... AD-A247778
TR-10
N92-27705 # p 3177 ..... AD-A247795
N92-27706 # p 3036 ..... AGARD-R-786
ISBN-92-835-0661-8
N92-27707 # p 3036 ..... NO REPORT NUMBER
N92-27708 # p 3036 ..... NO REPORT NUMBER
N92-27709* p 3036 ..... NO REPORT NUMBER
N92-27710 # p 3036 ..... NO REPORT NUMBER
N92-27711 # p 3037 ..... NO REPORT NUMBER
N92-27712 # p 3037 ..... NO REPORT NUMBER
N92-27713* # p 3037 ..... NO REPORT NUMBER
N92-27714 # p 3037 ..... NO REPORT NUMBER
N92-27715 # p 3081 ..... GRI-91/0382
PB92-164383
N92-27716 # p 3168 ..... AD-A246903
AFOSR-92-0013TR
N92-27717 # p 3084 ..... AD-A246904
NAVSWC-TR-91-460
N92-27718 # p 3149 ..... AD-A246906
N92-27719 # p 3045 ..... AD-A246908
AFIT/GLM/ENS/91S-50
N92-27720 # p 3168 ..... AD-A246909
TR-11-ONR
N92-27721* # p 3056 ..... L-17092-PT-1
NAS 1.55:3152-PT-1
NASA-CP-3152-PT-1
N92-27722* # p 3056 ..... NO REPORT NUMBER
N92-27723* # p 3057 ..... NO REPORT NUMBER
N92-27724* # p 3057 ..... NO REPORT NUMBER
N92-27725* # p 3057 ..... NO REPORT NUMBER
N92-27726* # p 3057 ..... NO REPORT NUMBER
N92-27727* # p 3057 ..... NO REPORT NUMBER
N92-27728* # p 3057 ..... NO REPORT NUMBER
N92-27729* # p 3057 ..... NO REPORT NUMBER
N92-27730* # p 3058 ..... NO REPORT NUMBER
N92-27731* # p 3058 ..... NO REPORT NUMBER
N92-27732* # p 3058 ..... NO REPORT NUMBER
N92-27733* # p 3058 ..... NO REPORT NUMBER
N92-27734* # p 3058 ..... NO REPORT NUMBER
N92-27735* # p 3059 ..... NO REPORT NUMBER
N92-27736* # p 3059 ..... NO REPORT NUMBER
N92-27737* # p 3059 ..... NO REPORT NUMBER
N92-27738* # p 3059 ..... NO REPORT NUMBER
N92-27739* # p 3059 ..... NO REPORT NUMBER
N92-27740* # p 3059 ..... NO REPORT NUMBER
N92-27741* # p 3059 ..... NO REPORT NUMBER
N92-27742* # p 3060 ..... NO REPORT NUMBER
N92-27743* # p 3060 ..... NO REPORT NUMBER
N92-27744* # p 3060 ..... NO REPORT NUMBER
N92-27745* # p 3060 ..... NO REPORT NUMBER
N92-27746* # p 3060 ..... NO REPORT NUMBER
N92-27747* # p 3060 ..... NO REPORT NUMBER
N92-27748 # p 3154 ..... CONF-9206101-2
DE92-006739
SAND-92-0031C
N92-27749 # p 3069 ..... AD-A246087
N92-27750 # p 3043 ..... AD-A246398
N92-27751 # p 3162 ..... AD-A246399
N92-27752 # p 3069 ..... AD-A246407
MTL-TR-91-54
N92-27753 # p 3052 ..... AD-A246638
N92-27754 # p 3182 ..... AD-A246641
AFIT/GSM/LSR/91S-3
N92-27755 # p 3154 ..... AD-A246644
N92-27756 # p 3168 ..... AD-A246647
RL-TR-91-317
N92-27757 # p 3104 ..... AD-A246651
PME-FM-91-3
N92-27758 # p 3084 ..... AD-A246653
RL-TR-91-343
N92-27759 # p 3091 ..... AD-A246655
R92-930033F
N92-27760 # p 3114 ..... AD-A246661
AFIT/GSM/LSG/91S-6
N92-27761 # p 3069 ..... AD-A246662
FMI/JRL-92/001
N92-27762 # p 3157 ..... AD-A246665
BRL-TR-3315
N92-27763* # p 3154 ..... NAS 1.55:10098
NASA-CP-10098
N92-27764* # p 3155 ..... NO REPORT NUMBER
N92-27765* # p 3155 ..... NO REPORT NUMBER
N92-27766* # p 3155 ..... NO REPORT NUMBER
N92-27767* # p 3155 ..... NO REPORT NUMBER
N92-27768* # p 3155 ..... NO REPORT NUMBER
N92-27769* # p 3155 ..... NO REPORT NUMBER
N92-27770* # p 3155 ..... NO REPORT NUMBER
N92-27771* # p 3155 ..... NO REPORT NUMBER
N92-27772* # p 3155 ..... NO REPORT NUMBER
N92-27773* # p 3156 ..... NO REPORT NUMBER
N92-27774* # p 3156 ..... NO REPORT NUMBER
N92-27775* # p 3156 ..... NO REPORT NUMBER
N92-27776* # p 3145 ..... NO REPORT NUMBER
N92-27777* # p 3156 ..... NO REPORT NUMBER
N92-27778* # p 3152 ..... NO REPORT NUMBER
N92-27779* # p 3156 ..... NO REPORT NUMBER
N92-27780* # p 3113 ..... NO REPORT NUMBER
N92-27781* # p 3156 ..... NO REPORT NUMBER
N92-27782* # p 3156 ..... NO REPORT NUMBER
N92-27783 # p 3084 ..... AD-A246020
N92-27784 # p 3084 ..... AD-A246040
N92-27785 # p 3091 ..... AD-A246043
N92-27786 # p 3135 ..... AD-A246066
N92-27787 # p 3130 ..... AD-A246070
N92-27788* # p 3061 ..... L-17092-PT-2
NAS 1.55:3152-PT-2
NASA-CP-3152-PT-2
N92-27789* # p 3061 ..... NO REPORT NUMBER
N92-27790* # p 3061 ..... NO REPORT NUMBER
N92-27791* # p 3061 ..... NO REPORT NUMBER
N92-27792* # p 3052 ..... NO REPORT NUMBER
N92-27793* # p 3061 ..... NO REPORT NUMBER
N92-27794* # p 3062 ..... NO REPORT NUMBER
N92-27795* # p 3062 ..... NO REPORT NUMBER
N92-27796* # p 3062 ..... NO REPORT NUMBER
N92-27797* # p 3062 ..... NO REPORT NUMBER
N92-27798* # p 3062 ..... NO REPORT NUMBER
N92-27799* # p 3063 ..... NO REPORT NUMBER
N92-27800* # p 3063 ..... NO REPORT NUMBER
N92-27801* # p 3052 ..... NO REPORT NUMBER
N92-27802* # p 3053 ..... NO REPORT NUMBER
N92-27803* # p 3053 ..... NO REPORT NUMBER
N92-27804* # p 3053 ..... NO REPORT NUMBER
N92-27805* # p 3064 ..... NO REPORT NUMBER
N92-27806* # p 3064 ..... NO REPORT NUMBER
N92-27807* # p 3064 ..... NO REPORT NUMBER
N92-27808* # p 3064 ..... NO REPORT NUMBER
N92-27809* # p 3064 ..... NO REPORT NUMBER
N92-27810* # p 3064 ..... NO REPORT NUMBER
N92-27811* # p 3065 ..... NO REPORT NUMBER
N92-27812* # p 3065 ..... NO REPORT NUMBER
N92-27813* # p 3065 ..... NO REPORT NUMBER
N92-27814* # p 3065 ..... NO REPORT NUMBER
N92-27815* # p 3065 ..... NO REPORT NUMBER
N92-27816* # p 3065 ..... NO REPORT NUMBER
N92-27817 # p 3049 ..... AD-A246123
N92-27818 # p 3194 ..... AD-A246271
DREO-TN-91-26
N92-27819 # p 3069 ..... AD-A246408
MTL-TR-92-7
N92-27820 # p 3135 ..... AD-A246446
CERC-WIS-25
N92-27821 # p 3074 ..... AD-A246447
N92-27822 # p 3140 ..... AD-A246449
N92-27823 # p 3106 ..... AD-D015201
NAVY-CASE-73480
US-PATENT-APPL-SN-762818
N92-27824 # p 3182 ..... AD-A246878
AFIT/GSS/LSM/91D-5
N92-27825 # p 3140 ..... AD-A247048
AFOSR-92-0135TR
N92-27826 # p 3169 ..... AD-A247935
FR-10106
MTL-TR-91-38
N92-27827 # p 3069 ..... AD-A246018
AMTL-FR-12.91-PHASE-1
MTL-TR-91-49-PHASE-1
N92-27828 # p 3104 ..... AD-A246057
N92-27829* # p 3149 ..... NAS 1.26:190363
NASA-CR-190363
N92-27830* # p 3149 ..... NO REPORT NUMBER
N92-27831* # p 3149 ..... NO REPORT NUMBER
N92-27832* # p 3145 ..... NO REPORT NUMBER
N92-27833* # p 3150 ..... NO REPORT NUMBER
N92-27834 # p 3158 ..... AD-A246064
BRL-TR-3307
N92-27835 # p 3071 ..... AD-A246065
DNA-TR-90-209
RDA-TR-0226129003-002
N92-27836 # p 3052 ..... AD-A246458
AL-18
N92-27837 # p 3077 ..... AD-A246483
N92-27838 p 3169 ..... AD-D015210
US-PATENT-APPL-SN-583778
US-PATENT-CLASS-250-231.18
US-PATENT-5,073,711
N92-27839 # p 3140 ..... AD-A247096
AFOSR-92-0109TR
N92-27840 # p 3091 ..... AD-A247108
TR-21
N92-27841 # p 3194 ..... AD-A247212
AFOSR-92-0078TR
N92-27842 # p 3130 ..... AD-A247216
NOARL-13
N92-27843* # p 3182 ..... ISBN-0-16-035949-X
NAS 1.83:151
NASA-NP-151
N92-27844 # p 3137 ..... AD-A247103
AFOSR-92-0110TR
N92-27845 # p 3130 ..... AD-A247435
AD-E200886
PL-TR-92-2021
N92-27846 # p 3125 ..... AD-A247928
APL-UW-TR-9204
N92-27847 # p 3091 ..... AD-A247957
RL-TR-91-372
N92-27848 # p 3150 ..... AD-A247910
N92-27849 # p 3069 ..... AD-A247921
PASC005-01-00
WL-TR-92-8016
N92-27850 # p 3116 ..... AD-A247922
NUWC-NL-TR-10015
N92-27851 # p 3110 ..... AD-A247927
BFLRF-275
N92-27852 # p 3160 ..... AD-A247929
N92-27853 # p 3071 ..... AD-A247999
AFOSR-92-0138TR
N92-27854 # p 3161 ..... AD-A248003
N92-27855 # p 3084 ..... AD-A245339
JC-2091-GT-F3
N92-27856 # p 3069 ..... CONF-920144-5
DE92-010449
UCRL-JC-107929
N92-27857 # p 3106 ..... AD-A245932
CSS-TM-567-91

N92-27858 # p 3085 ..... AD-A245936
DREO-TN-91-16
N92-27859 # p 3130 ..... AD-A247455
RCC/MG-381-92
N92-27860 # p 3184 ..... AD-A247780
NWC-TP-7203
N92-27861 # p 3091 ..... AD-A247786
N92-27862 # p 3065 ..... AD-A247799
AFOSR-92-0072TR
N92-27863 # p 3140 ..... AD-A247830
AL-TR-1991-0134
N92-27864 # p 3085 ..... AD-A247834
ESD-TR-91-224
MTR-11135
N92-27865 # p 3116 ..... AD-A248020
ASIAC-TR-91-1
WL-TR-91-3101
N92-27866* # p 3173 ..... AD-A248161
CMU-RI-TR-92-02
NAS 1.26:190465
NASA-CR-190465
N92-27867 # p 3077 ..... AD-A248164
TR-010
N92-27868 # p 3150 ..... AD-A248167
AFIT/GCS/ENG/92M-01
N92-27869 # p 3091 ..... AD-A248296
N92-27870 # p 3046 ..... AGARD-AR-311
ISBN-92-835-0665-0
N92-27871* # p 3169 ..... NAS 1.26:190399
NASA-CR-190399
UAH-5-32589
N92-27872* # p 3116 ..... NAS 1.26:189154
NASA-CR-189154
N92-27873* # p 3169 ..... NAS 1.26:190405
NASA-CR-190405
TTU-124-894-83
N92-27874* # p 3116 ..... NAS 1.26:186516
NASA-CR-186516
N92-27875 # p 3074 ..... DE92-619932
INIS-BR-2917
N92-27876* # p 3196 ..... NAS 1.26:190404
NASA-CR-190404
N92-27877* # p 3136 ..... NAS 1.15:107546
NASA-TM-107546
N92-27878* # p 3067 ..... E-7069
NAS 1.15:105689
NASA-TM-105689
N92-27879* # p 3111 ..... AVSCOM-TR-91-C-049
E-6826
NAS 1.15:105416
NASA-TM-105416
N92-27880* # p 3104 ..... NAS 1.26:190430
NASA-CR-190430
N92-27881 # p 3119 ..... AD-A247000
N92-27882 # p 3173 ..... CTN-92-60517
PPL-114
N92-27883 # p 3173 ..... CTN-92-60519
IAEA-CN-53-I-2-1
PPL-116
N92-27884 # p 3092 ..... AD-A247785
N92-27885 # p 3184 ..... AD-A247787
N92-27886 # p 3104 ..... AD-A247792
N92-27887 # p 3031 ..... AGARD-CP-504
ISBN-92-835-0662-6
N92-27888 # p 3031 ..... NO REPORT NUMBER
N92-27889 # p 3031 ..... NO REPORT NUMBER
N92-27890 # p 3031 ..... NO REPORT NUMBER
N92-27891 # p 3031 ..... NO REPORT NUMBER
N92-27892* # p 3032 ..... NO REPORT NUMBER
N92-27893 # p 3032 ..... NO REPORT NUMBER
N92-27894* # p 3032 ..... NO REPORT NUMBER
N92-27895 # p 3032 ..... NO REPORT NUMBER
N92-27896 # p 3033 ..... NO REPORT NUMBER
N92-27897 # p 3033 ..... NO REPORT NUMBER
N92-27898 # p 3033 ..... NO REPORT NUMBER
N92-27899 # p 3033 ..... NO REPORT NUMBER
N92-27900 # p 3033 ..... NO REPORT NUMBER
N92-27901 # p 3033 ..... NO REPORT NUMBER
N92-27902 # p 3034 ..... NO REPORT NUMBER
N92-27903 # p 3034 ..... NO REPORT NUMBER
N92-27904 # p 3034 ..... NO REPORT NUMBER
N92-27905 # p 3034 ..... NO REPORT NUMBER
N92-27906 # p 3034 ..... NO REPORT NUMBER
N92-27907* # p 3035 ..... NO REPORT NUMBER
N92-27908 # p 3135 ..... AD-A247804
N92-27909 # p 3158 ..... IHES/M/91/80
PB92-134410
N92-27910 # p 3141 ..... AD-A247823
AL-TR-1991-0119
N92-27911 # p 3184 ..... AD-A245775
N92-27912 # p 3130 ..... AD-A245779
N92-27913 # p 3074 ..... BNL-46407
CONF-911202-66
DE92-009373
N92-27914 # p 3043 ..... AD-A246445
DOT/FAA/AM-92/3
N92-27915 # p 3160 ..... AD-A246666
ESD-TR-91-104
TR-890
N92-27916 # p 3044 ..... AD-A247825
AL-TR-1991-0121
N92-27917 # p 3184 ..... AD-A246900
N92-27918 # p 3105 ..... AD-A247056
AFOSR-92-0015TR
N92-27919 # p 3150 ..... AD-A247267
STARS-TC-04040/001/00
N92-27920 # p 3169 ..... AD-A247439
AD-E040224
NOARL-TN-191
N92-27921 # p 3174 ..... AD-A247827
NRL/MR/4681-92-6941
N92-27922 # p 3127 ..... AD-A247501
AD-E040222
NOARL-TN-182
N92-27923 # p 3150 ..... NISTIR-4740
PB92-172014
N92-27924 # p 3162 ..... AATTC-TOP-7-3-530
AD-A247831
N92-27925 # p 3047 ..... AD-A248326
N92-27926 # p 3081 ..... ETN-92-98849
RR-416
N92-27927 # p 3080 ..... ETN-92-98030
ISL-CO-215/89
N92-27928 # p 3182 ..... B-247885
GAO/NSIAD-92-171BR
N92-27929* p 3035 ..... NAS 1.21:7037(277)
NASA-SP-7037(277)
N92-27930* # p 3135 ..... NAS 1.61:1278
NASA-RP-1278
REPT-92B00058
N92-27931 # p 3053 ..... JPRS-USP-92-001
N92-27932 # p 3053 ..... NO REPORT NUMBER
N92-27933 # p 3053 ..... NO REPORT NUMBER
N92-27934 # p 3053 ..... NO REPORT NUMBER
N92-27935 # p 3194 ..... AD-A248461
AFOSR-92-0193TR
N92-27936 # p 3037 ..... AGARD-CP-507
ISBN-92-835-0660-X
N92-27937* # p 3037 ..... NO REPORT NUMBER
N92-27938* # p 3038 ..... NO REPORT NUMBER
N92-27939 # p 3038 ..... NO REPORT NUMBER
N92-27940 # p 3038 ..... NO REPORT NUMBER
N92-27941 # p 3038 ..... NO REPORT NUMBER
N92-27942 # p 3038 ..... NO REPORT NUMBER
N92-27943 # p 3038 ..... NO REPORT NUMBER
N92-27944 # p 3039 ..... NO REPORT NUMBER
N92-27945 # p 3039 ..... NO REPORT NUMBER
N92-27946 # p 3039 ..... NO REPORT NUMBER
N92-27947 # p 3039 ..... NO REPORT NUMBER
N92-27948 # p 3039 ..... NO REPORT NUMBER
N92-27949 # p 3039 ..... NO REPORT NUMBER
N92-27950 # p 3040 ..... NO REPORT NUMBER
N92-27951 # p 3040 ..... NO REPORT NUMBER
N92-27952 # p 3040 ..... NO REPORT NUMBER
N92-27953 # p 3040 ..... NO REPORT NUMBER
N92-27954 # p 3040 ..... NO REPORT NUMBER
N92-27955* # p 3040 ..... NO REPORT NUMBER
N92-27956 # p 3041 ..... NO REPORT NUMBER
N92-27957* # p 3041 ..... NO REPORT NUMBER
N92-27958 # p 3041 ..... NO REPORT NUMBER
N92-27959 # p 3041 ..... NO REPORT NUMBER
N92-27960* # p 3041 ..... NO REPORT NUMBER
N92-27961 # p 3042 ..... NO REPORT NUMBER
N92-27962 # p 3042 ..... NO REPORT NUMBER
N92-27963 # p 3127 ..... AD-A248572
AFOSR-92-0230TR
N92-27964 # p 3044 ..... AD-A248657
PL-TR-91-2248
SBI-AD-E200944
N92-27965 # p 3092 ..... AD-A248681
N92-27966 # p 3077 ..... AD-A248738
DTRC-SME-92-11
N92-27967 # p 3070 ..... AD-A248741
MTL-TR-92-3
N92-27968 # p 3138 ..... AD-A248743
AFOSR-92-0264
REPT-5-27959
N92-27969 # p 3141 ..... AD-A248761
ARI-RN-92-90
N92-27970 # p 3085 ..... AD-A248891
ARO-26988.1-GS
N92-27971 # p 3141 ..... AD-A248894
ARI-RN-92-18
REPT-0012
N92-27972* # p 3162 ..... NAS 1.26:189274
NASA-CR-189274
N92-27973 # p 3047 ..... DOT/FAA/CT-91/19
N92-27974* # p 3117 ..... NAS 1.60:3214
NASA-TP-3214
S-763
N92-27975* # p 3105 ..... NAS 1.26:189143
NASA-CR-189143
N92-27976* # p 3052 ..... MCAT-92-012
NAS 1.26:188055
NASA-CR-188055
N92-27977* # p 3052 ..... NO REPORT NUMBER
N92-27978* # p 3052 ..... NO REPORT NUMBER
N92-27979 # p 3182 ..... AD-A246625
AFIT/GSM/LSY/91S-5
N92-27980 # p 3157 ..... AD-A246626
AFIT/GLM/LSM/91S-11
N92-27981 # p 3183 ..... AD-A246627
AFIT/GLM/LSM/91S-34
N92-27982 # p 3046 ..... AD-A246633
REPT-86PR1314
N92-27983 # p 3177 ..... AD-A246895
N92-27984 # p 3150 ..... AD-A246896
N92-27985 # p 3177 ..... AD-A246899
SC5345.FR
N92-27986 # p 3105 ..... AD-A247001
AFOSR-92-0022TR
NEAR-TR-443
N92-27987 # p 3157 ..... AD-A247003
AFOSR-92-0010TR
N92-27988 # p 3131 ..... AD-A247051
AFOSR-92-0125TR
N92-27989 # p 3141 ..... AD-A247198
AFOSR-92-0139TR
N92-27990 # p 3143 ..... AD-A247298
WRAIR-TR-91-001
N92-27991 # p 3143 ..... AD-A248351
USAARL-92-8
N92-27992 # p 3092 ..... AD-A248573
RL-TR-91-377
N92-27993 # p 3106 ..... AD-A248652
AD-E200939
PL-TR-91-1071
N92-27994 # p 3055 ..... AD-A248653
N92-27995 # p 3150 ..... AD-A248759
N92-27996 # p 3111 ..... AD-A248883
UDR-TR-91-35
WL-TR-91-4086
N92-27997 # p 3185 ..... AD-A248897
ESD-TR-91-267
MTR-11194
N92-27998 p 3163 ..... AD-D015223
US-PATENT-APPL-SN-582277
US-PATENT-CLASS-324-77
US-PATENT-5,028,864
N92-27999 p 3169 ..... AD-D015224
US-PATENT-APPL-SN-560702
US-PATENT-CLASS-365-24
US-PATENT-5,066,148
N92-28000 p 3092 ..... AD-D015225
US-PATENT-APPL-SN-589102
US-PATENT-CLASS-445-24
US-PATENT-5,057,047
N92-28001 p 3170 ..... AD-D015226
US-PATENT-APPL-SN-582274
US-PATENT-CLASS-250-227.17
US-PATENT-5,063,290
N92-28002 p 3046 ..... AD-D015228
US-PATENT-APPL-SN-597134
US-PATENT-CLASS-89-1.816
US-PATENT-5,058,481
N92-28003 # p 3085 ..... AD-A248377
AD-E200919
ERP-1082-VOL-2
PL-TR-91-2076-VOL-2
N92-28004 # p 3047 ..... AD-A248378
AD-E200941
PL-TR-91-2236
SR-3
N92-28005 # p 3085 ..... AD-A248386
DRIC-BR-309631
RSRE-MEMO-4561
N92-28006 # p 3151 ..... AD-A248389
WES/TR/EL-92-17
N92-28007 # p 3170 ..... AD-A248393
NRL/MR/6505-92-6963
N92-28008 # p 3164 ..... AD-A248401
TR-2
N92-28009 # p 3072 ..... AD-A248410
N92-28010 # p 3135 ..... AD-A248692
N92-28011 # p 3163 ..... AD-A248693
NSMRL-1171
N92-28012 # p 3177 ..... AD-A248706
DTRC/SME-92-09
N92-28013* # p 3119 ..... JPL-PUBL-91-30
NAS 1.26:190461
NASA-CR-190461
N92-28014* # p 3119 ..... NO REPORT NUMBER
N92-28015* # p 3119 ..... NO REPORT NUMBER
N92-28016* # p 3119 ..... NO REPORT NUMBER
N92-28017* # p 3119 ..... NO REPORT NUMBER
N92-28018* # p 3120 ..... NO REPORT NUMBER
N92-28019* # p 3120 ..... NO REPORT NUMBER
N92-28020* # p 3120 ..... NO REPORT NUMBER

N92-28021* # p 3120 ..... NO REPORT NUMBER
N92-28022* # p 3120 ..... NO REPORT NUMBER
N92-28023* # p 3121 ..... NO REPORT NUMBER
N92-28024* # p 3088 ..... NO REPORT NUMBER
N92-28025* # p 3088 ..... NO REPORT NUMBER
N92-28026* # p 3121 ..... NO REPORT NUMBER
N92-28027* # p 3121 ..... NO REPORT NUMBER
N92-28028* # p 3122 ..... NO REPORT NUMBER
N92-28029* # p 3088 ..... NO REPORT NUMBER
N92-28030* # p 3088 ..... NO REPORT NUMBER
N92-28031* # p 3088 ..... NO REPORT NUMBER
N92-28032* # p 3088 ..... NO REPORT NUMBER
N92-28033* # p 3088 ..... NO REPORT NUMBER
N92-28034* # p 3088 ..... NO REPORT NUMBER
N92-28035* # p 3088 ..... NO REPORT NUMBER
N92-28036* # p 3123 ..... NO REPORT NUMBER
N92-28037* # p 3123 ..... NO REPORT NUMBER
N92-28038* # p 3088 ..... NO REPORT NUMBER
N92-28039 # p 3131 ..... AD-A245352
N92-28040 # p 3185 ..... AD-A245555
NCSC-TR-79-91
N92-28041 # p 3117 ..... CONF-920631-13
DE92-009408
WSRC-MS-91-420
N92-28042 # p 3188 ..... DE92-010381
DOE/ER-0538T
N92-28043 # p 3072 ..... DE92-011220
DOE/ER-13847/3
N92-28044 # p 3174 ..... DE92-621531
ITP-91-31
N92-28045 # p 3166 ..... CONF-920266
DE92-011077
SU-SLAC-392
N92-28046 # p 3072 ..... DE92-011189
DOE/ER-13864/T1
N92-28047 # p 3164 ..... DE92-011219
LBL-31877
N92-28048 # p 3151 ..... DE92-011375
WSRC-IM-90-83-5
N92-28049 # p 3151 ..... AD-A246009
N92-28050 # p 3141 ..... AD-A248411
AFOSR-92-0204TR
N92-28051 # p 3109 ..... AD-A248412
AFOSR-92-0197TR
N92-28052 # p 3043 ..... AD-A248887
DOT/FAA/RD-91/1
SCT-91RR-31
N92-28053 # p 3074 ..... AD-A249099
WL-TR-91-4121
N92-28054 # p 3107 ..... CONF-9205127-1
DE92-010827
SAND-92-0517C
N92-28055 # p 3115 ..... DE92-010850
EGG-EE-9965
N92-28056 # p 3125 ..... ANL/RP-75587
DE92-010866
N92-28057 # p 3174 ..... DE92-011131
DOE/ER-53285/2
N92-28058 # p 3105 ..... AD-A245962
N92-28059 # p 3194 ..... AD-A248480
N92-28060 # p 3158 ..... AD-A248582
AFOSR-92-0225TR
SSM/92/1
N92-28061 # p 3158 ..... AD-A248583
AFOSR-92-0226TR
N92-28062 # p 3105 ..... AD-A248596
AFOSR-92-0214TR
N92-28063 # p 3144 ..... AD-A248602
RL-TR-91-359
N92-28064 # p 3072 ..... AD-A248612
EOARD-TR-92-06
N92-28065 # p 3085 ..... AD-A248632
N92-28066 # p 3085 ..... AD-A248951
N92-28067 # p 3092 ..... AD-A248952
N92-28068 # p 3151 ..... AD-A249120
COINS-TR-88-02
N92-28069 # p 3151 ..... AD-A246716
AFIT/GSS/ENG/91D-9
N92-28070 # p 3080 ..... AD-A246725
AD-E200838
PL-TR-91-3058
N92-28071 # p 3143 ..... AD-A246934
AL-TR-1991-0082
N92-28072 # p 3128 ..... AD-A246937
N92-28073 # p 3049 ..... AD-A246938
R/D-5824-AN-01
N92-28074 # p 3111 ..... AD-A246941
N92-28075 # p 3151 ..... AD-A247039
AFOSR-92-0157TR
N92-28076 # p 3049 ..... AD-A247040
AFOSR-92-0163TR
N92-28077 # p 3177 ..... AD-A247047
TR-9
N92-28078 # p 3218 ..... AD-A248776
AFOSR-92-0180TR-VOL-13
N92-28079 # p 3044 ..... AD-A248954
WES/TR/D-92-2
N92-28080 # p 3092 ..... AD-A248957
TR-6
N92-28081 # p 3178 ..... AD-A248958
TR-7
N92-28082 # p 3151 ..... AD-A248960
TR-325
N92-28083 # p 3183 ..... AD-A249125
DOT/FAA/AM-92/13
N92-28084 # p 3086 ..... AGARD-LS-184
ISBN-92-835-0673-1
N92-28085 # p 3086 ..... NO REPORT NUMBER
N92-28086 # p 3086 ..... NO REPORT NUMBER
N92-28087 # p 3086 ..... NO REPORT NUMBER
N92-28088 # p 3086 ..... NO REPORT NUMBER
N92-28089 # p 3086 ..... NO REPORT NUMBER
N92-28090 # p 3086 ..... NO REPORT NUMBER
N92-28091 # p 3086 ..... NO REPORT NUMBER
N92-28092 # p 3087 ..... NO REPORT NUMBER
N92-28093 # p 3048 ..... NO REPORT NUMBER
N92-28094 # p 3141 ..... AD-A247197
AFOSR-92-0141TR
N92-28095 # p 3144 ..... AD-A248760
USAARL-92-16
N92-28096 # p 3218 ..... AD-A248772
AFOSR-92-0176TR-VOL-9
N92-28097 # p 3218 ..... AD-A248773
AFOSR-92-0177TR-VOL-10
N92-28098 # p 3219 ..... AD-A248774
AFOSR-92-0178TR-VOL-11
N92-28099 # p 3219 ..... AD-A248775
AFOSR-92-0179TR-VOL-12
N92-28100 p 3087 ..... BBC-RD-1992/1
N92-28101 p 3087 ..... BBC-RD-1992/2
N92-28102* # p 3042 ..... AIAA-92-3098
E-7116
NAS 1.15:105720
NASA-TM-105720
N92-28103 # p 3087 ..... AD-A246727
AD-E200874
PL-TR-91-2191-VOL-2
VI-1707-B-VOL-2
N92-28104 # p 3152 ..... AD-A246728
AFIT/GLM/LSR/91S-24
N92-28105 # p 3164 ..... AD-A246738
TR-119
N92-28106 # p 3152 ..... AD-A246749
AFIT/GSS/LSY/91D-4
N92-28107 # p 3179 ..... AD-A246751
N92-28108 # p 3136 ..... AD-A246752
N92-28109 # p 3219 ..... AD-A248769
AFOSR-92-0173TR-VOL-6
N92-28110 # p 3219 ..... AD-A248770
AFOSR-92-0174TR-VOL-7
N92-28111 # p 3219 ..... AD-A248771
AFOSR-92-0175TR-VOL-8
N92-28112* # p 3185 ..... NAS 1.15:107923
NASA-TM-107923
N92-28113* # p 3185 ..... AD-A251966
NAS 1.15:107949
NASA-TM-107949
N92-28114* # p 3185 ..... AD-A251967
NAS 1.15:107931
NASA-TM-107931
N92-28115* # p 3186 ..... NAS 1.15:107950
NASA-TM-107950
N92-28116* # p 3186 ..... AD-A252057
NAS 1.15:107926
NASA-TM-107926
N92-28117* # p 3186 ..... NAS 1.15:107930
NASA-TM-107930
N92-28118 # p 3046 ..... AD-A246350
ARL-STRUC-TM-538
DODA-AR-006-620
N92-28119 # p 3075 ..... AD-A246836
N92-28120 # p 3072 ..... AD-A246847
TR-121
N92-28121 # p 3093 ..... AD-A246848
N92-28122 # p 3072 ..... AD-A246849
N92-28123 # p 3046 ..... AD-A248568
N92-28124 # p 3109 ..... AD-A248733
N92-28125 # p 3170 ..... AD-A248735
WSU/DC/92-TR-83
N92-28126 # p 3078 ..... AD-A248736
CDNSWC-SME-92-08
N92-28127 # p 3219 ..... AD-A248767
AFOSR-92-0171TR-VOL-5A
N92-28128 # p 3219 ..... AD-A248768
AFOSR-92-0172TR-VOL-5B
N92-28129 # p 3087 ..... AD-A246754
N92-28130 # p 3093 ..... AD-A246802
N92-28131 # p 3109 ..... AD-A246803
N92-28132 # p 3044 ..... AD-A246814
AFIT/GSS/ENG/91D-3
N92-28133 # p 3044 ..... AD-A246818
NPS-OC-91-006
N92-28134 # p 3087 ..... AD-A246820
N92-28135 # p 3138 ..... AD-A247004
AFOSR-92-0134TR
N92-28136 # p 3075 ..... AD-A247005
MT-CWR-092-013
N92-28137 # p 3093 ..... AD-A247006
AFOSR-92-0020TR
SRA-R92-910028F
N92-28138 # p 3117 ..... AD-A247009
AFOSR-92-0120TR
N92-28139 # p 3075 ..... AD-A247924
SSC-SSR-1311-VOL-3
SSC-352-VOL-3
N92-28140 # p 3160 ..... AD-A248453
TR-70
N92-28141 # p 3093 ..... AD-A248456
N92-28142 # p 3142 ..... AD-A248460
N92-28143 # p 3075 ..... AD-A249142
ARCCB-MR-92008
N92-28144 # p 3158 ..... AD-A246882
CRSE-91-02
N92-28145 # p 3072 ..... AD-A246886
AFOSR-92-0121TR
N92-28146 # p 3162 ..... AD-A247036
N92-28147 # p 3196 ..... AD-A247038
AFOSR-92-0106TR
N92-28148 # p 3078 ..... AD-A248447
N92-28149 # p 3186 ..... NO REPORT NUMBER
N92-28150* # p 3152 ..... NAS 1.26:189939
NASA-CR-189939
N92-28151 # p 3042 ..... ISSN-0452-2982
JTN-92-80377
NAL-TM-640T
N92-28152 # p 3042 ..... ISSN-0452-2982
JTN-92-80378
NAL-TM-641
N92-28153 # p 3046 ..... ISSN-0389-4010
JTN-92-80379
NAL-TR-1102
N92-28154 # p 3051 ..... ISSN-0389-4010
JTN-92-80380
NAL-TR-1103
N92-28155* # p 3186 ..... NAS 1.15:107928
NASA-TM-107928
N92-28156* # p 3183 ..... NAS 1.15:107935
NASA-TM-107935
NSSDC/WDC-A-R/S-88-16
N92-28157* # p 3144 ..... NAS 1.15:107943
NASA-TM-107943
N92-28158 # p 3117 ..... CTN-92-60469
ISBN-0-315-59931-6
N92-28159 # p 3078 ..... BARC-1551
DE92-620035
N92-28160 # p 3179 ..... CONF-9111182-4
DE92-010742
SU-SLAC-PUB-5730
N92-28161 # p 3081 ..... AD-A245907
N92-28162 # p 3049 ..... AD-A245910
N92-28163 # p 3152 ..... AD-A245914
N92-28164 # p 3142 ..... AD-A245923
NAMRL-1366
N92-28165 # p 3178 ..... AD-A245929
RL-TR-91-312
N92-28166 # p 3144 ..... AD-A245937
DREO-TN-91-24
N92-28167 # p 3093 ..... AD-A246258
N92-28168 # p 3131 ..... AD-A247134
AD-E040221
NOARL-TN-160
N92-28169 # p 3152 ..... AD-A247322
N92-28170 # p 3142 ..... AD-A248578
AFOSR-92-0265TR
N92-28171 # p 3115 ..... AD-A248585
AFOSR-92-0257TR
N92-28172 # p 3183 ..... AD-A249122
N92-28173 # p 3154 ..... CONF-9204106-2
DE92-010292
N92-28174 # p 3166 ..... CONF-920315-8
DE92-010748
SU-SLAC-PUB-5769
N92-28175 # p 3105 ..... AD-A247171
AFOSR-92-0164TR
N92-28176 # p 3142 ..... AD-A247173
AFOSR-92-0075TR
N92-28177 # p 3144 ..... AD-A247295
AL-TP-1992-0002
N92-28178 # p 3117 ..... AD-A248584
CMS-TSR-92-10
N92-28179 # p 3142 ..... AD-A248586
AFOSR-92-0260TR
N92-28180 # p 3081 ..... AD-A248591
N92-28181 # p 3170 ..... AD-A248594
RL-TR-91-383
N92-28182 # p 3160 ..... AD-A248598
ARO-28809.3-MA-SDI
SU-TR-71

N92-28183* # p 3186 ..... NAS 1.15:107924
NASA-TM-107924
N92-28184* # p 3187 ..... NAS 1.15:107929
NASA-TM-107929
N92-28185* # p 3192 ..... NAS 1.15:107940
NASA-TM-107940
NSSDC/WDC-A-R/S-87-06
N92-28186* # p 3187 ..... NAS 1.15:107939
NASA-TM-107939
NSSDC/WDC-A-R/S-87-05
N92-28187* # p 3088 ..... NAS 1.15:107936
NASA-TM-107936
NSSDC/WDC-A-R/S-87-09
N92-28188* # p 3187 ..... NAS 1.15:107934
NASA-TM-107934
NSSDC/WDC-A-R/S-89-23
N92-28189 # p 3158 ..... AD-A247202
AFOSR-92-0155TR
N92-28190 # p 3042 ..... ISSN-0552-2982
JTN-92-80376
NAL-TM-639
N92-28191 # p 3047 ..... ISSN-0389-4010
JTN-92-80382
NAL-TR-1113
N92-28192 # p 3043 ..... ISSN-0389-4010
JTN-92-80383
NAL-TR-1115-PT-1
N92-28193 # p 3174 ..... CTN-92-60502
FFP-3-91
PPL-122
N92-28194 # p 3174 ..... CTN-92-60508
PPL-106
N92-28195 # p 3174 ..... CTN-92-60509
PPL-104
N92-28196 # p 3175 ..... CTN-92-60512
PPL-108
N92-28197 # p 3175 ..... CTN-92-60515
PPL-111
N92-28198 # p 3175 ..... CTN-92-60516
PPL-113
N92-28199 # p 3136 ..... CGCR-91-12
CTN-92-60529
N92-28200 # p 3125 ..... CGCR-91-9
CTN-92-60530
N92-28201 # p 3128 ..... CRG-89-6-PT-2
CTN-92-60531
N92-28202 # p 3070 ..... AD-A248637
NMAB-460
N92-28203* # p 3081 ..... NAS 1.15:107932
NASA-TM-107932
N92-28204 # p 3175 ..... CTN-92-60510
PPL-105
N92-28205 # p 3175 ..... CTN-92-60511
PPL-107
N92-28206 # p 3125 ..... EPA/600/A-92/069
PB92-164995
N92-28207 # p 3072 ..... ARB-R-92/484
PB92-167311
N92-28208 # p 3125 ..... EPA/600/R-92/056
PB92-170166
N92-28209* # p 3051 ..... CSDL-T-1106
NAS 1.26:185680
NASA-CR-185680
N92-28210* # p 3158 ..... CSC/TM-88/6001
NAS 1.26:189281
NASA-CR-189281
N92-28211* # p 3187 ..... NAS 1.15:107927
NASA-TM-107927
N92-28212* # p 3138 ..... NAS 1.15:107933
NASA-TM-107933
N92-28213* # p 3066 ..... NAS 1.15:107942
NASA-TM-107942
N92-28214 # p 3118 ..... CONF-920298-1
DE92-011263
LA-UR-92-829
N92-28215 # p 3179 ..... DE92-622381
IC-91/42
N92-28216 # p 3106 ..... DE92-622860
IC-91/375
N92-28217 # p 3107 ..... AD-A249258
WL-TR-91-2124
N92-28218 # p 3178 ..... AD-A249262
ARO-24087.2-EL
N92-28219* # p 3055 ..... NAS 1.26:189270
NASA-CR-189270
N92-28220* # p 3187 ..... ISSN-0959-0846
NAS 1.15:107925
NASA-TM-107925
N92-28221* # p 3194 ..... NAS 1.26:189865
NASA-CR-189865
REPT-554-FDD-91/125
SEAS-(550)/IM-91/047-(52-404)
N92-28222* # p 3126 ..... NAS 1.15:107952
NASA-TM-107952
R11-1681

Appendix

NASA SCIENTIFIC AND TECHNICAL INFORMATION PROGRAM PRODUCTS AND SERVICES

The NASA Scientific and Technical Information (STI) Program provides for the collection and announcement of aerospace-related reports and literature obtained worldwide through agreements and exchanges. The result of the collection is the comprehensive NASA STI Database that covers aeronautics, space, and supporting disciplines.

The STI Database, documents generated or obtained by NASA, and products and services derived from or supporting the database are made available to the NASA research community and to the public. Descriptions and sources of these items are presented in the following pages.

Scientific and Technical Aerospace Reports (*STAR*) is an abstract journal, listing citations with abstracts for aerospace-related reports obtained from worldwide sources. *STAR* is issued on the 8th and 23rd of each month and announces current documents that have been entered into the NASA STI Database during the previous two weeks. The reports are of the following types:

- NASA, NASA contractor, and NASA grantee reports;
- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms;
- Translations in report form;
- NASA-owned patents and patent applications;
- Other U.S. Government agency and foreign patents and patent applications;
- Domestic and foreign dissertations and theses.

Journal, book, and conference literature, journal translations, and certain foreign dissertations having the same subject scope as *STAR* are announced in a companion journal, *International Aerospace Abstracts* (*IAA*). *IAA* is issued on the 1st and 15th of each month and is available from the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, NY 10019.

ELIGIBILITY AND REGISTRATION FOR NASA STI PRODUCTS AND SERVICES

Organizations of the type listed below that have registered with NASA can receive products and services.

- NASA offices and installations, contractors, subcontractors, grantees, and consultants;
- Other U.S. Government agencies and their contractors;
- Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public reference;
- Other organizations in the United States having a need for NASA documents in work related to aeronautics and space research;
- Organizations abroad that have established reciprocal documents exchange arrangements with NASA.

Only the central service points or central points of document acquisition and control within qualified organizations are eligible to register for NASA STI products and services. Domestic organizations that may be eligible to receive various classes of NASA publications and services should address their requests for registration or further information to:

NASA Center for AeroSpace Information
ATTN: Registration Services
P.O. Box 8757
Baltimore, MD 21240-0757
301-621-0153

Organizations abroad should direct requests to:

National Aeronautics and Space Administration
Director, Scientific and Technical Information Program
Code JTT
Washington, DC 20546
USA
703-271-5640

SUBJECT SCOPE

The subject scope of *STAR* and *IAA* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

HOW TO USE *STAR* SUBJECT CATEGORIES

Abstracts in *STAR* are categorized by 10 major subject divisions that are divided further into 76 specific subject categories. The subject divisions and categories are listed in the Table of Contents together with a note for each that defines its scope and provides any cross-references. For example:

16 SPACE TRANSPORTATION
Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance.* For space suits see *54 Man/System Technology and Life Support.*

CROSS-REFERENCES

Individual *STAR* abstracts are not ordinarily cross-referenced, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

DOCUMENTS ON MICROFICHE

Documents available on microfiche are designated by a pound sign (#) following the accession number.

LIMITED REPRODUCIBILITY

A note of limited reproducibility appears in the citation, if there are factors affecting the reproducibility of more than 20% of the document. These factors include faint or broken type, color photographs, black and white photographs, foldouts, dot matrix print, or some other factor that limits the reproducibility of the document. This notation also appears on the microfiche header with the specific factor checked off on a list visible in the second frame.

COLOR COPIES

An increasing number of NASA scientific and technical reports are being produced with color graphs, charts, illustrations, and photographs. An indication that a document has color pages follows the source and pricing (SAP) information in the *STAR* citation.

Registered users of the NASA Scientific and Technical Information Program will receive ordered documents with color at no additional cost, as long as stock copies of the document are available. Otherwise, an additional fee of $2.00 per color page will be charged. The NASA Center for AeroSpace Information staff will contact registered users to determine individual user's needs.

NASA PATENTS AND PATENT APPLICATIONS

Patents and patent applications owned by NASA are announced in *STAR* under appropriate subject categories and are referenced in the *STAR* indexes. In the Report/Accession Number Index, patents are indexed by the NASA Case Number, and the U.S. Patent Class. Patent applications are indexed by the NASA Case Number and the U.S. Patent Application Serial Number.

Printed copies of patents (which are not microfiched) are available for purchase from the U.S. Patent and Trademark Office.

NASA patent application specifications are sold in both paper copy and microfiche by the National Technical Information Service (NTIS). The US-Patent-Appl-SN-number should be used in ordering either paper copy or microfiche from NTIS.

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the U.S. Patent and Trademark Office.

The patents and patent applications announced in *STAR* are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further information should be addressed to:

National Aeronautics and Space Administration
Associate General Counsel for Intellectual Property
Code GP
Washington, DC 20546

SOURCES FOR DOCUMENTS

One or more sources from which a document announced in *STAR* is available to the public is given in each citation. The most commonly indicated sources and their acronyms or abbreviations are listed on page A-6. If the publication is available from a source other than those listed, the publisher and address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page A-7.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, VA 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report number* shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, as indicated above, for those documents identified by a # symbol.)

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, address inquiry to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts.* Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on Engineering Sciences Data Unit (ESDU) topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on page A-6.

Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, DC 20546, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of $1.50 each, postage free. (See discussion of NASA patents and patent applications below.)

Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on page A-6. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

FEDERAL DEPOSITORY LIBRARIES: To provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. (These libraries are not sales outlets.) At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the regional GPO libraries, appears on page A-8. A local library can contact a regional depository library to help locate specific reports, or direct contact may be made by an individual.

PUBLIC COLLECTION OF NASA DOCUMENTS

An extensive collection of NASA and NASA-sponsored publications is maintianed by the British Library Lending Divison, Boston Spa, Wetherby, Yorkshire, England, for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*.

European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and * from ESA—Information Retrieval Service, European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.

SUBMITTING DOCUMENTS

All users of this abstract service are urged to forward reports to be considered for announcement in *STAR*. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those you will transmit to NASA, DOD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to the NASA Center for AeroSpace Information, P.O. Box 8757, Baltimore, MD 21240-0757.

Reprints of journal articles, book chapters, and conference papers are also welcome. These will be considered for announcement in *STAR*'s companion journal, *IAA*.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on a public sale at the National Technical Information Service. Copyrighted publications will be announced but not distributed or sold.

PURCHASE OF *STAR*

STAR is publicly available on annual subscription from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

STAR is available to registered users on annual subscription from the NASA Center for AeroSpace Information, ATTN: Registration Services, P.O. Box 8757, Baltimore, MD 21240-0757.

Microfiche of the abstract sections of *STAR* are available, on annual subscription only, from NTIS as PB92-911300, Attn: Subscriptions, 5285 Port Royal Road, Springfield, VA 22161. Annual subscription rates are $100.00 North America; $200.00 foreign. Abstract sections for previous years retroactive to 1964 are available at the current rates.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

European Space Agency-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Engineering Sciences Data Unit International
P.O. Box 1633
Manassas, Virginia 22110

Engineering Sciences Data Unit International, Ltd.
251-259 Regent Street
London, W1R 7AD, England

Fachinformationszentrum Energie, Physik, Mathematik
GMBH
7514 Eggenstein Leopoldshafen
Federal Republic of Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Center for AeroSpace Information
P.O. Box 8757
Baltimore, Maryland 21240-0757

National Aeronautics and Space Administration
Scientific and Technical Information Program (JTT)
Washington, DC 20546-0001

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, Virginia 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, Arizona 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, Colorado 80225

NTIS PRICE SCHEDULES

(Effective October 1, 1991)

Schedule A
STANDARD PRICE DOCUMENTS AND MICROFICHE**

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	$ 9.00	$ 18.00
A02	12.50	25.00
A03	17.00	34.00
A04-A05	19.00	38.00
A06-A09	26.00	52.00
A10-A13	35.00	70.00
A14-A17	43.00	86.00
A18-A21	50.00	100.00
A22-A25	59.00	118.00
A99	*	*
N01	60.00	120.00
N02	59.00	118.00
N03	20.00	40.00

Schedule E
EXCEPTION PRICE DOCUMENTS AND MICROFICHE**

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
E01	$11.00	$ 22.00
E02	14.00	28.00
E03	16.00	32.00
E04	19.00	38.00
E05	21.00	42.00
E06	24.00	48.00
E07	27.00	54.00
E08	30.00	60.00
E09	33.00	66.00
E10	36.00	72.00
E11	39.00	78.00
E12	43.00	86.00
E13	46.00	92.00
E14	50.00	100.00
E15	54.00	108.00
E16	59.00	118.00
E17	64.00	128.00
E18	69.00	138.00
E19	76.00	152.00
E20	88.00	176.00
E99	*	*

* Contact NTIS for price quote.

** Effective January 1, 1991, the microfiche copy of any new document entering the NTIS collection will be priced the same as the paper copy of the document.

IMPORTANT NOTICE

NTIS Shipping and Handling Charges

U.S., Canada, Mexico — ADD $3.00 per TOTAL ORDER

All Other Countries — ADD $4.00 per TOTAL ORDER

Exceptions — Does NOT apply to:

ORDERS REQUESTING NTIS RUSH HANDLING

ORDERS FOR SUBSCRIPTION OR STANDING ORDER PRODUCTS *ONLY*

NOTE: Each additional delivery address on an order requires a separate shipping and handling charge.

FEDERAL REGIONAL DEPOSITORY LIBRARIES

ALABAMA

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Dept.
7300 University Drive
Montgomery, AL 36117-3596
(205) 244-3650 FAX: (205) 244-0678

UNIV. OF ALABAMA
Amelia Gayle Gorgas Library
Govt. Documents
Box 870266
Tuscaloosa, AL 35487-0266
(205) 348-6046 FAX: (205) 348-8833

ARIZONA

DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS
Federal Documents
Third Floor State Capitol
1700 West Washington
Phoenix, AZ 85007
(602) 542-4121 FAX: (602) 542-4400; 542-4500

ARKANSAS

ARKANSAS STATE LIBRARY
State Library Services
One Capitol Mall
Little Rock, AR 72201
(501) 682-2869

CALIFORNIA

CALIFORNIA STATE LIBRARY
Govt. Publications Section
914 Capitol Mall - P.O. Box 942837
Sacramento, CA 94237-0001
(916) 322-4572 FAX: (916) 324-8120

COLORADO

UNIV. OF COLORADO - BOULDER
Norlin Library
Govt. Publications
Campus Box 184
Boulder, CO 80309-0184
(303) 492-8834 FAX: (303) 492-2185

DENVER PUBLIC LIBRARY
Govt. Publications Dept. BS/GPD
1357 Broadway
Denver, CO 80203
(303) 571-2135

CONNECTICUT

CONNECTICUT STATE LIBRARY
231 Capitol Avenue
Hartford, CT 06106
(203) 566-4971 FAX: (203) 566-3322

FLORIDA

UNIV. OF FLORIDA LIBRARIES
Documents Dept.
Library West
Gainesville, FL 32611-2048
(904) 392-0366 FAX: (904) 392-7251

GEORGIA

UNIV. OF GEORGIA LIBRARIES
Govt. Documents Dept.
Jackson Street
Athens, GA 30602
(404) 542-8949 FAX: (404) 542-6522

HAWAII

UNIV. OF HAWAII
Hamilton Library
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948-8230 FAX: (808) 956-5968

IDAHO

UNIV. OF IDAHO LIBRARY
Documents Section
Moscow, ID 83843
(208) 885-6344 FAX: (208) 885-6817

ILLINOIS

ILLINOIS STATE LIBRARY
Reference Dept.
300 South Second
Springfield, IL 62701-1796
(217) 782-7596 FAX: (217) 524-0041

INDIANA

INDIANA STATE LIBRARY
Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204
(317) 232-3678 FAX: (317) 232-3728

IOWA

UNIV. OF IOWA LIBRARIES
Govt. Publications Dept.
Washington & Madison Streets
Iowa City, IA 52242
(319) 335-5926 FAX: (319) 335-5830

KANSAS

UNIV. OF KANSAS
Govt. Documents & Map Library
6001 Malatt Hall
Lawrence, KS 66045-2800
(913) 864-4660 FAX: (913) 864-5380

KENTUCKY

UNIV. OF KENTUCKY LIBRARIES
Govt. Publications/Maps Dept.
Lexington, KY 40506-0039
(606) 257-3139 FAX: (606) 257-1563; 257-8379

LOUISIANA

LOUISIANA STATE UNIV.
Middleton Library
Govt. Documents Dept.
Baton Rouge, LA 70803
(504) 388-2570 FAX: (504) 388-6992

LOUISIANA TECHNICAL UNIV.
Prescott Memorial Library
Govt. Documents Dept.
305 Wisteria Street
Ruston, LA 71270-9985
(318) 257-4962 FAX: (318) 257-2447

MAINE

TRI-STATE DOCUMENTS DEPOSITORY
Raymond H. Fogler Library
Govt. Documents & Microforms Dept.
Univ. of Maine
Orono, ME 04469
(207) 581-1680

MARYLAND

UNIV. OF MARYLAND
Hornbake Library
Govt. Documents/Maps Unit
College Park, MD 20742
(301) 454-3034 FAX: (301) 454-4985

MASSACHUSETTS

BOSTON PUBLIC LIBRARY
Govt. Documents Dept.
666 Boylston Street
Boston, MA 02117
(617) 536-5400 ext. 226
FAX: (617) 267-8273; 267-8248

MICHIGAN

DETROIT PUBLIC LIBRARY
5201 Woodward Avenue
Detroit, MI 48202-4093
(313) 833-1440; 833-1409
FAX: (313) 833-5039

LIBRARY OF MICHIGAN
Govt. Documents Unit
P.O. Box 30007
Lansing, MI 48909
(517) 373-0640 FAX: (517) 373-3381

MINNESOTA

UNIV. OF MINNESOTA
Wilson Library
Govt. Publications Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 624-5073 FAX: (612) 626-9353

MISSISSIPPI

UNIV. OF MISSISSIPPI
J.D. Williams Library
Federal Documents Dept.
106 Old Gym Bldg.
University, MS 38677
(601) 232-5857 FAX: (601) 232-5453

MISSOURI

UNIV. OF MISSOURI - COLUMBIA
Ellis Library
Govt. Documents
Columbia, MO 65201
(314) 882-6733 FAX: (314) 882-8044

MONTANA

UNIV. OF MONTANA
Maureen & Mike Mansfield Library
Documents Div.
Missoula, MT 59812-1195
(406) 243-6700 FAX: (406) 243-2060

NEBRASKA

UNIV. OF NEBRASKA - LINCOLN
D.L. Love Memorial Library
Documents Dept.
Lincoln, NE 68588
(402) 472-2562

NEVADA

UNIV. OF NEVADA
Reno Library
Govt. Publications Dept.
Reno, NV 89557
(702) 784-6579 FAX: (702) 784-1751

NEW JERSEY

NEWARK PUBLIC LIBRARY
U.S. Documents Div.
5 Washington Street - P.O. Box 630
Newark, NJ 07101-0630
(201) 733-7812 FAX: (201) 733-5648

NEW MEXICO

UNIV. OF NEW MEXICO
General Library
Govt. Publications Dept.
Albuquerque, NM 87131-1466
(505) 277-5441 FAX: (505) 277-6019

NEW MEXICO STATE LIBRARY
325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-3826 FAX: (505) 827-3820

NEW YORK

NEW YORK STATE LIBRARY
Documents/Gift & Exchange Section
Federal Depository Program
Cultural Education Center
Albany, NY 12230
(518) 474-5563 FAX: (518) 474-5786

NORTH CAROLINA

UNIV. OF NORTH CAROLINA - CHAPEL HILL
CB#3912, Davis Library
BA/SS Dept.—Documents
Chapel Hill, NC 27599
(919) 962-1151 FAX: (919) 962-0484

NORTH DAKOTA

NORTH DAKOTA STATE UNIV. LIBRARY
Documents Office
Fargo, ND 58105
(701) 237-8886 FAX: (701) 237-7138
In cooperation with Univ. of North Dakota, Chester Fritz Library
Grand Forks

OHIO

STATE LIBRARY OF OHIO
Documents Dept.
65 South Front Street
Columbus, OH 43266
(614) 644-7051 FAX: (614) 752-9178

OKLAHOMA

OKLAHOMA DEPT. OF LIBRARIES
U.S. Govt. Information Div.
200 NE 18th Street
Oklahoma City, OK 73105-3298
(405) 521-2502, ext. 252, 253
FAX: (405) 525-7804

OKLAHOMA STATE UNIV.
Edmon Low Library
Documents Dept.
Stillwater, OK 74078
(405) 744-6546 FAX: (405) 744-5183

OREGON

PORTLAND STATE UNIV.
Millar Library
934 SW Harrison - P.O. Box 1151
Portland, OR 97207
(503) 725-3673 FAX: (503) 725-4527

PENNSYLVANIA

STATE LIBRARY OF PENN.
Govt. Publications Section
Walnut St. & Commonwealth Ave. - P.O. Box 1601
Harrisburg, PA 17105
(717) 787-3752

SOUTH CAROLINA

CLEMSON UNIV.
Cooper Library
Public Documents Unit
Clemson, SC 29634-3001
(803) 656-5174 FAX: (803) 656-3025
In cooperation with Univ. of South Carolina, Thomas Cooper Library, Columbia

TENNESSEE

MEMPHIS STATE UNIV. LIBRARIES
Govt. Documents
Memphis, TN 38152
(901) 678-2586 FAX: (901) 678-2511

TEXAS

TEXAS STATE LIBRARY
United States Documents
P.O. Box 12927 - 1201 Brazos
Austin, TX 78711
(512) 463-5455 FAX: (512) 463-5436

TEXAS TECH. UNIV. LIBRARY
Documents Dept.
Lubbock, TX 79409
(806) 742-2268 FAX: (806) 742-1920

UTAH

UTAH STATE UNIV.
Merrill Library & Learning Resources Center, UMC-3000
Documents Dept.
Logan, UT 84322-3000
(801) 750-2684 FAX: (801) 750-2677

VIRGINIA

UNIV. OF VIRGINIA
Alderman Library
Govt. Documents
Charlottesville, VA 22903-2498
(804) 924-3133 FAX: (804) 924-4337

WASHINGTON

WASHINGTON STATE LIBRARY
Document Section
MS AJ-11
Olympia, WA 98504-0111
(206) 753-4027 FAX: (206) 753-3546

WEST VIRGINIA

WEST VIRGINIA UNIV. LIBRARY
Govt. Documents Section
P.O. Box 6069
Morgantown, WV 26506
(304) 293-3640

WISCONSIN

ST. HIST. SOC. OF WISCONSIN LIBRARY
Govt. Publications Section
816 State Street
Madison, WI 53706
(608) 262-2781 FAX: (608) 262-4711
In cooperation with Univ. of Wisconsin-Madison, Memorial Library

MILWAUKEE PUBLIC LIBRARY
Documents Div.
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 278-2167 FAX: (414) 278-2137

* U.S. G.P.O.:1992-313-125:60018

National Aeronautics and
Space Administration
Code JTT
Washington, D.C.
20546-0001

Official Business
Penalty for Private Use, $300

SPECIAL FOURTH-CLASS RATE
POSTAGE & FEES PAID
NASA
PERMIT No. G27

POSTMASTER: If Undeliverable (Section 158
Postal Manual) Do Not Return